July 12, 1934

JUL 1 1 1934

Engineering News-Record

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Large Precast Concrete Pipe
For Little Morongo Siphon

Design Modifications for T.V.A.'s Norris Dam

Earthquake Resistance of Joist Anchors
in Masonry Walls

Long-Range Weather Cycles Held Non-Existent

Vibration Problem in Tall Stacks
Solved By Aerodynamics

Tygart Reservoir for Pittsburgh Flood Safety

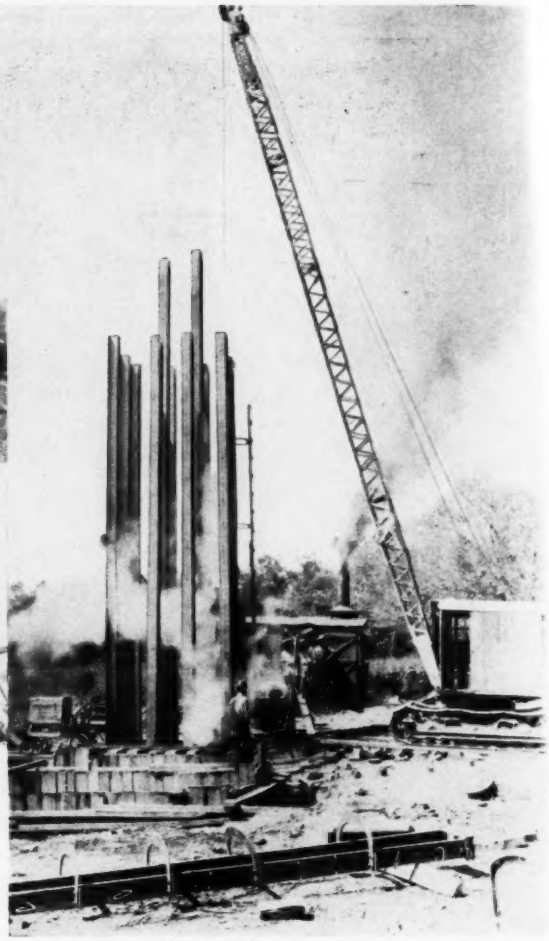
Large Concrete Structure
Launched Like a Ship

Sewage-Plant Survey Data From Grand Rapids

Report of A.S.T.M. Annual Convention—Part II

● *Partially completed highway bridge near Leeper, Wayne County, Missouri, in which CB Sections were used as bearing piles.*

● *On the Leeper bridge, construction was facilitated by welding sills for the concrete cap to the tops of the steel bearing piles.*



● *Driving steel bearing piles for highway bridge at Hendrickson, Mo.*

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Industry *Not* Overbuilt

FROM time to time during the last few years of tribulation, the construction industry and other producers of capital goods have been warned by one authority or another that our productive industries all are "immensely overbuilt." Out of such assertions have arisen many misgivings as to the future demand for capital goods and services.

Now comes a study designed to ascertain the facts with respect to this absorbing question. It is embodied in a volume entitled "America's Capacity to Produce," prepared by Edwin G. Nourse and associates and published by The Brookings Institution of Washington. It deserves close reading and thoughtful reflection by everyone whose fortunes are bound up with the constructive functions of our national economy.

It is the first of four books, the other three of which are to consider in turn our capacity to consume, the financial processes of production and the effect upon our economic progress of our present distribution of income.

The present volume attempts to present an objective and realistic picture of the actual situation with respect to productive capacity in the United States during the period from 1900 to 1930. It seeks to measure the amount by which our existing capacities have exceeded the actual production required of them.

An effort has been made to hold the study to a practical basis. It takes no account of scientific discoveries and developments that have not yet been embodied in the practice of industry. It deals not with theoretically maximum capacities but only with the practical results that could be realized through the technology and under the operating conditions with which we have had experience. It does not consider each industry as operating in a vacuum but rather in its appropriate place as one link in the chain of production and service that composes the economic system. It seeks an answer to the question "what *could* have been produced?" rather than "what *might* have been produced?" These conditions and the reasoning by which they were applied to the study are clearly set forth in the foreword and introduction.

From this study it appears that in 1929 our productive system as a whole was operating at about 80 per cent of capacity and, if we take the average of the five years 1925-29, at slightly less. For both the mineral and the manufacturing industries, in which the most definite and satisfactory measurements were possible, a rate of 83 per cent of utilization was found for 1929; during the period 1925-29 it was 83 percent for the mineral industries and 80 per cent for the manufacturing industries.

Taking into account the fact that each industry must be operated not independently, but as part of an interrelated whole, the study concludes that the maximum attainable capacity should be reduced from a potential 100 per cent to 95 per cent, thereby leaving a margin of 15 per cent above the actual 80 per cent as the slack that might have been taken up by closer coordination and management. This would mean an increase of 19 per cent above what was produced in the late twenties.

The study shows, moreover, that in general, the margin of unutilized plant capacity did not expand during the period from 1900 to 1930. Of the various industries studied, transportation alone showed a disproportionate increase in capacity, due chiefly to the rapid development during that period of new forms of transportation.

All of which, and much more that is available in this interesting book, tends to dispose of the notion that we suffer from an extravagant expansion of *physical productive capacity*. What might be revealed by a similar study of the financial structure involved in the creation and administration of that capacity is another story.

Possibly future volumes of this series will shed some light on this and help the technical men of industry to read the enigma of scarcity amid plenty. Now that we know that our productive plant is not in fact "vastly overbuilt," we may yet learn why it is that every so often we must do without the things we need because we are able to make so many of them.

Willard Chevalier

NRA CODE 1934

ENGINEERING NEWS-RECORD

Published every Thursday. Vol. 113, No. 2. Price 25c. per copy. Subscription, domestic, Mexico, Central and South American countries, $5 per year. Canada, including duty, $7.50. All other countries, $9 a year or 36 shillings. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U.S.A. Cable Address "McGrawhill, New York." Member A.B.P. Member A.B.C. Copyright 1934 by

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

Editorial and Publishing Offices: 330 West 42d Street, New York; 520 North Michigan Avenue, Chicago; 883 Mission Street, San Francisco; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C.

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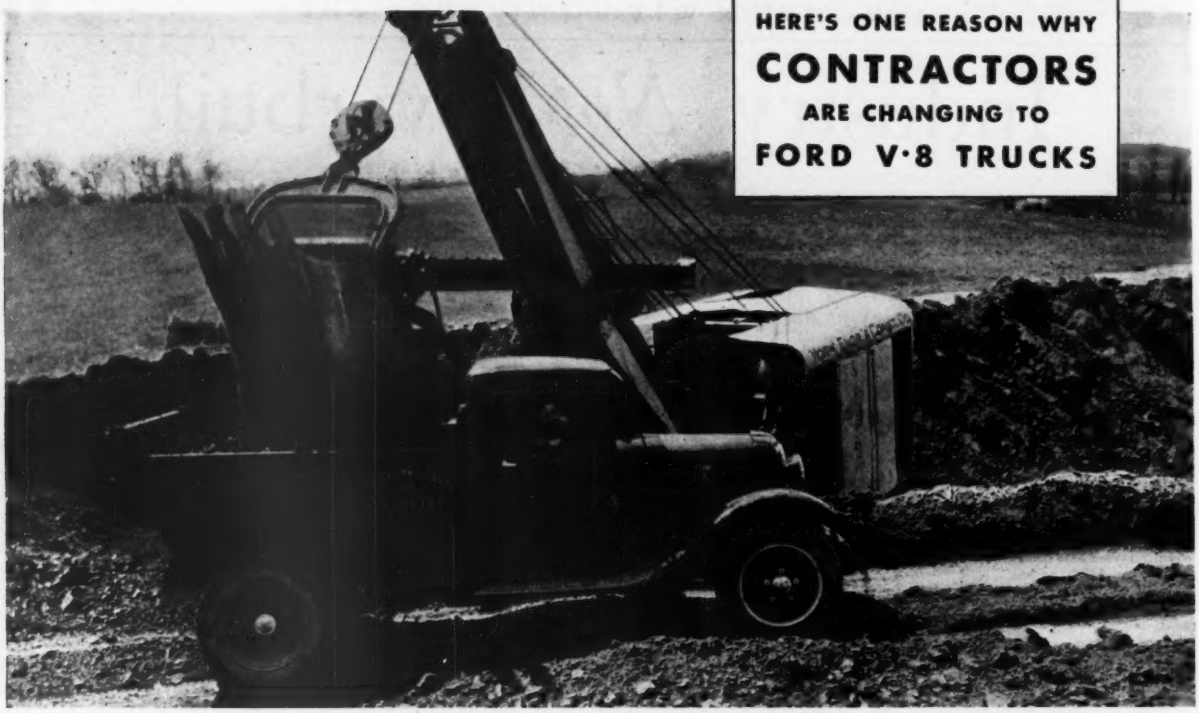

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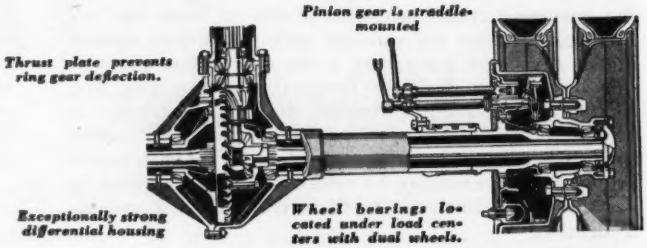
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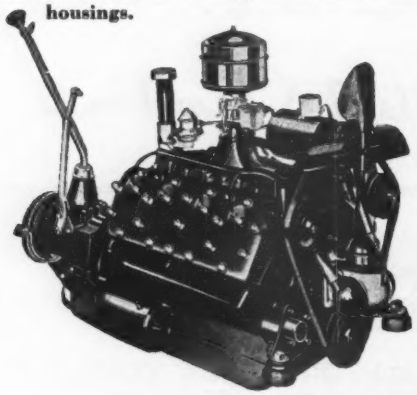

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In the News:

PWA, during the last week of June, approved 1,241 allotments for non-federal projects—a new record. The money involved totaled nearly $190,000,000, estimated to create 921,000 man-months of field employment. Largest allotments were $3,000,000 to Providence, R. I., for schools, and $2,570,000 to New Orleans for sewers.

WATERLOO BRIDGE, the nine-span stone-arch structure that John Rennie built over the Thames in London in 1817, is being demolished to make way for a new six-lane bridge. The controversy that has raged for a quarter-century between sentiment and traffic requirements was ended when the London County Council voted to remove the bridge and build a new one. Parliament had recently voted to retain the bridge.

EMPLOYMENT on construction sites of PWA projects for the week ending June 23 totaled 544,000, an increase of 300,000 in the fifteen weeks since the low point on March 10.

THE COURT OF APPEALS in New York State has upheld the finding of a lower court that the Manhattan Railway Co. is entitled to no compensation for its franchise to operate an elevated railway in 42d St. from Third Ave. to Park Ave. This elevated line, a spur connection to the Grand Central Terminal, was acquired by the city by condemnation in 1923 and torn down the following year. It had been operated at a loss for years.

MUNICIPAL AND STATE bond financing for June totaled $124,056,580, compared with $81,155,053 for May, according to the *Daily Bond Buyer*.

THE NEW HOUSING HEAD, James A. Moffett, has spent the week since his appointment organizing the housing administration into several divisions: modernization, mortgage insurance and building-and-loan deposit insurance. He estimates the modernization program will be under way in 30 days.

TVA NOTE: To date, 289 municipalities have applied for TVA power; 38 industrial firms are considering locating in the Valley.

In This Issue:

RECALLING EXPERIENCES with concrete ships during the war, a contractor has recently used the methods then developed for building an intake well and pump house. Destined for an offshore location, the 530-ton structure was built on shore, launched on greased ways and towed 3 miles to previously prepared foundations.

AERODYNAMICS, as portrayed in our March 15 issue by W. W. Pagon, was a rather complex science whose importance to the civil engineer was readily apparent but whose actual application to field problems may have seemed somewhat remote. Mr. Pagon shows this view to have been false by describing in a second article the elimination of wind vibrations in a pair of tall power-house stacks, by use of aerodynamic knowledge.

RESTUDY of the requirements to be satisfied by the Norris Dam on the Clinch River in Tennessee resulted in several important changes in the original design. Navigation features are eliminated, the spillway is changed in character and location, and the capacity of the power plant is reduced about one-third.

FLOOD DANGER at Pittsburgh, so far as the Monongahela River is concerned, is destined to be reduced by the Tygart Reservoir, for which the PWA has allotted $3,000,000, to be spent on dam construction. Located in West Virginia on an upper tributary of the river, the work will be carried out by the Corps of Engineers.

SEWAGE-PLANT data from Grand Rapids, Mich., comprise the sixth statistical summary of salient design and performance characteristics of typical American sewage works to be published in these pages since April.

THE SECOND HALF of the report of the A.S.T.M. meeting in Atlantic City, June 25-29, covers developments in testing equipment, cement, concrete, brick and bituminous materials. Outstanding is a proposed new specification for a sulphate-resisting cement to supplement the standard portland product.

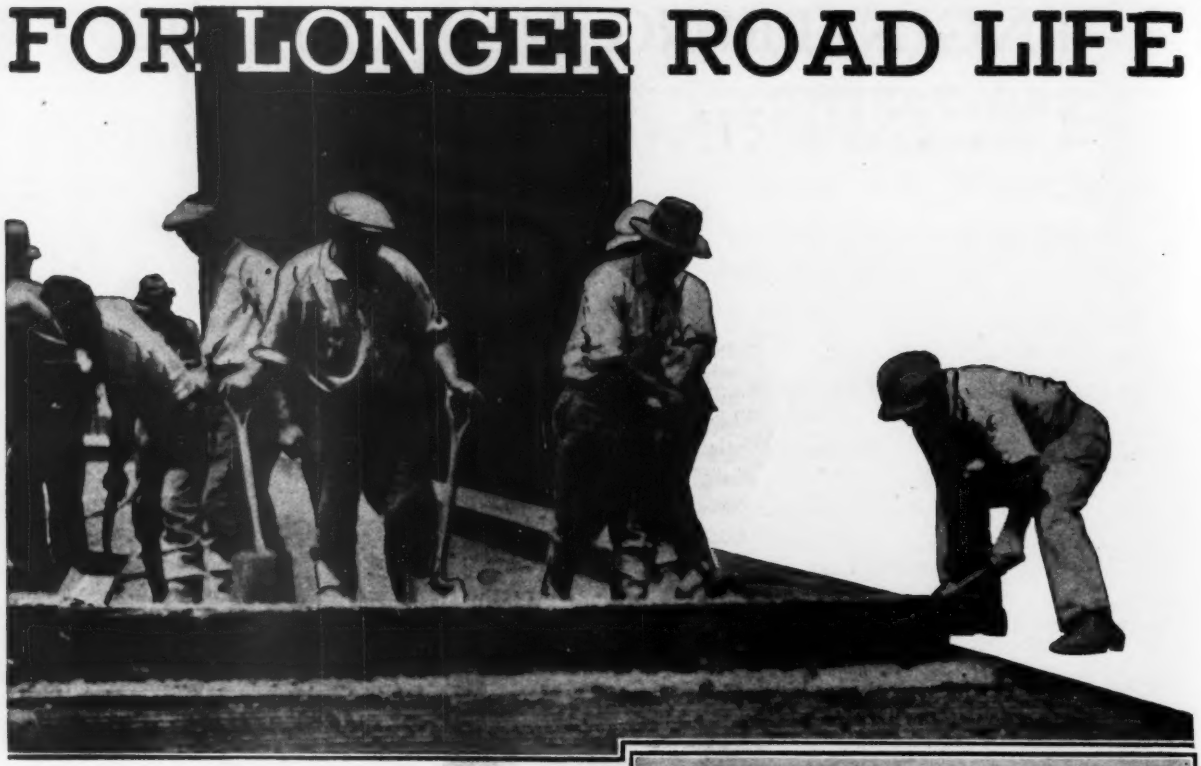
MERITS of precast and monolithic pipe, as determined by trial installations, are being studied by the Metropolitan Water District of Southern California before a choice is made for 150 siphon installations along the Colorado River Aqueduct. The 12-ft.-diameter precast pipe for the Little Morongo siphon is described in this issue.

EARTHQUAKE RESISTANCE of joist anchors in masonry walls can be greatly improved by using plate anchors, deeper embedment and blocking between joists, according to significant tests recently completed in California.

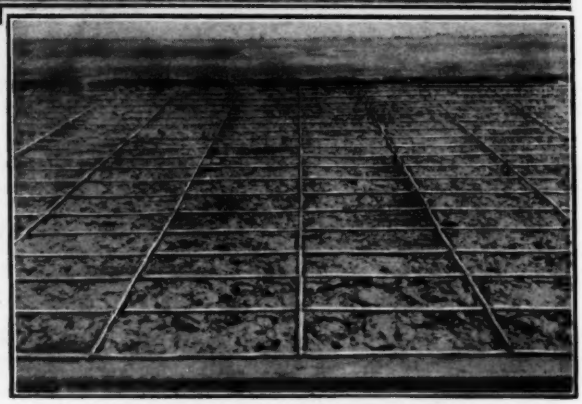
Coming Articles:

THE HETCH HETCHY AQUEDUCT, San Francisco's water-supply project which is being completed this summer after a 20-year construction period, will be reviewed in its wide variety of engineering works by a series of articles to appear in the Aug. 2 issue. Interpretative material will record the significant facts about costs, methods and progress, and a bibliography of some 150 articles will make the collection as a whole a most comprehensive coverage of the project.

FOR LONGER ROAD LIFE



...REINFORCE THE ENTIRE CONCRETE SLAB



LABORATORY tests and highway research have definitely established the superiority of the reinforced slab. Similar surveys have pointed to Wire Fabric as the perfect slab reinforcement. American Steel & Wire Company Wire Fabric provides complete distribution of cold drawn high tensile strength steel throughout the slab. This is the most effective reinforcement against cracks and slab disintegration. The public at large wants more and better roads—permanent wire fabric reinforced roads. The saving in maintenance costs appeals to them. The assurance of complete protection against cracks and breakage stimulates communities to foster comprehensive good road programs. Send for our handbook on Reinforced Roads and Streets.

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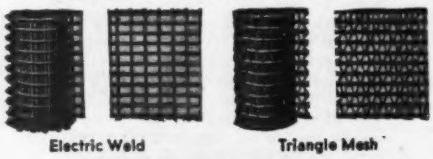

Electric Weld Triangle Mesh

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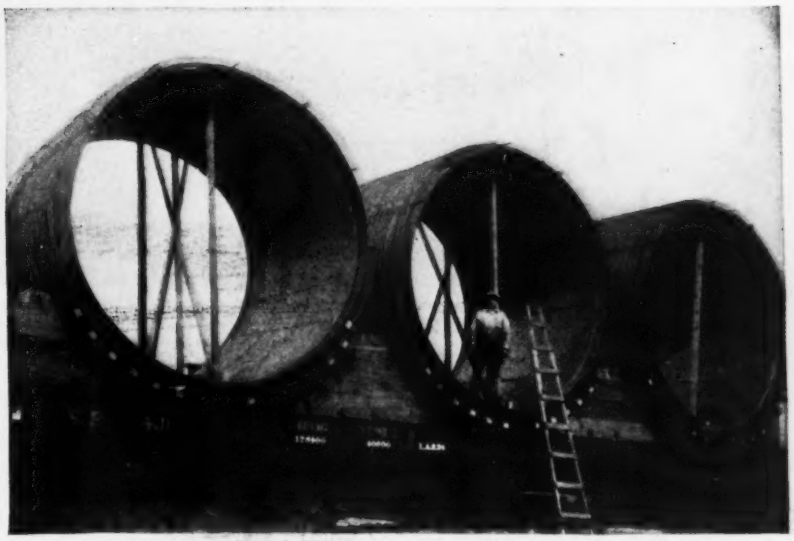


FIG. 1—COMPLETED CYLINDERS are loaded, three to the flat car, for shipment from the Los Angeles yard to the job on the desert.

Twelve-Foot Precast Concrete Pipe for Little Morongo Siphon

Merits of precast and monolithic jobs are being compared before selecting types for 150 siphons on Colorado River aqueduct—Reinforcing cages, including steel cylinders assembled in yard before shipment to desert location

By Richard B. Ward
Assistant Engineer,
Metropolitan Water District of Southern California

ALONG the 241-mile aqueduct being constructed by the Metropolitan Water District to bring Colorado River water to the Los Angeles metropolitan area there will be 150 inverted siphons ranging in length from 300 to 26,300 ft., with a total length of about 27 miles. Those having lengths less than 400 ft. and static heads less than 20 ft. are to be built of monolithic concrete, either as one 16-ft. pipe or three 9-ft. 9-in. square boxes, depending upon the type of adjoining structures. Those with lengths and heads exceeding these limits will be constructed in two-barrel units of: (1) 12-ft. 0-in. precast concrete; (2) 12-ft. 4-in. monolithic concrete; or (3) 12-ft. 4-in. steel pipes. Where double-barrel design is used, the transition structures and one of the barrels will be put in initially, and the second barrel will be added whenever more capacity is needed.

As an aid in comparing the relative merits of precast and monolithic concrete construction on large-diameter siphons and in order more nearly to perfect the plans and specifications, the district is making two trial installations: a 12-ft. 0-in. diameter precast pipe for the siphon across Little Morongo Canyon and a 12-ft. 4-in. monolithic siphon at Fan Hill. These siphons are nearly equal in length, each being a little over 700 ft. long. The Fan Hill siphon is being built by district forces, while the Little Morongo siphon is being built under contract.

The Little Morongo pipe sections (Fig. 4), which the author believes to be the largest fully precast concrete pipe ever made, will have a shell thickness of 12 in. and will be cast in 12-ft. lengths with lock-joint lead-gasket-type joints. The maximum hydrostatic head on the siphon will be 118 ft., and some parts of the line will be on slopes of 45 deg.

For heads less than 80 ft. the steel reinforcement will be of cage type—i.e., two circular cages of ½-in. round bars on 6-in. spacing, with one cage elliptical in shape with varying quantities of steel. For the heads above 80 ft., the reinforcement will consist of one circular cage of ½-in. round bars, one

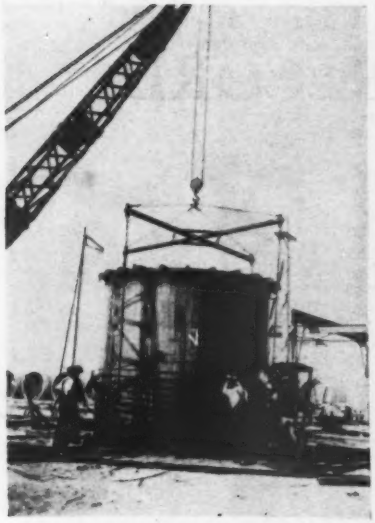


FIG. 2—PLACING 1-in. reinforcing on outside of the steel cylinder.

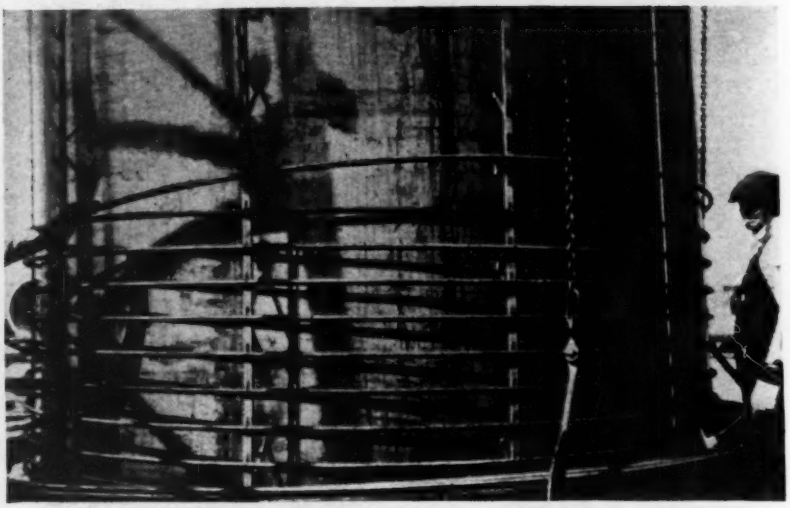


FIG. 3—REINFORCING STEEL is suspended in a coil slightly larger than the cage and is then placed by hand as shown. Note projecting tongues on vertical channels, which are driven down to hold the 1-in. bars in place.

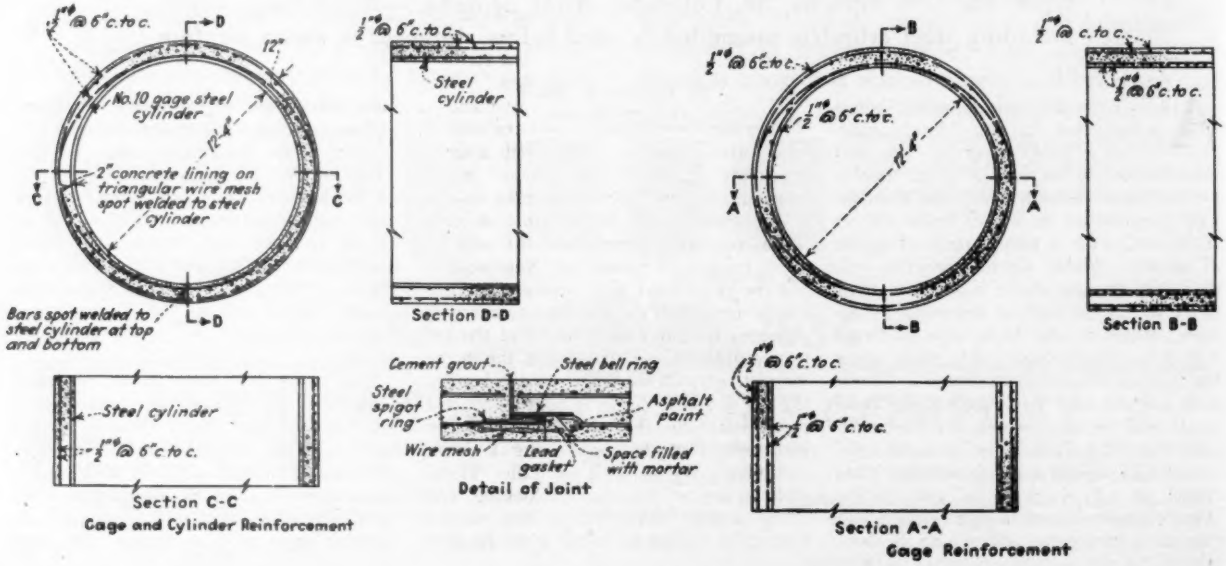
elliptical cage and a 12-ft. 4-in. diameter steel cylinder for watertightness. These steel cylinders will be made of 10-gage metal, electrically welded, with No. 040 triangular wire mesh spot-welded to the inner surface. Transverse reinforcement is either butt-welded rings or helically-wound steel bars or bands, each weld being tested to a stress of 27,000 lb. per sq.in.

The sheet metal for the steel cylinder is made up flat at the contractor's yard in Los Angeles by arc-welding together nine sheets 51 11/16 in. by 10 ft. 10½ in., which are then passed through a roll, forming the cylinder. The edges are next clamped together and the closing seam welded; then a slight bell is rolled on one end to fit the cylinder to the outside joint ring. The lock-joint type bell and spigot rings are then welded to the cylinders and the wire mesh inserted and tack-welded to the cylinder at numerous points. The completed cylinder is tested for leaks under a 10-lb. air pressure. The leaks are found by applying soapy water to the welded joints. All leaks are repaired at once, usually by calking, although a few places require rewelding. Several cylinders were first checked under a 5-lb. air pressure, and all holes were repaired; then the pressure was raised to 10 lb., and all joints were rechecked. A few additional leaks, so small as to be missed under the 5-lb. pressure test, were found under the rechecking with 10-lb. pressure.

The air testing of the cylinders was accomplished largely with a cast-steel base ring, an inside steel form and a steel tamping platform, which equipment was made primarily for use in casting the concrete pipe sections. Top and bottom air seals were obtained with spongy rubber gaskets of 1-in. thickness, these being placed on the base ring and in the annular space of the tamping platform. The tamping platform was held in place during the tests with twenty tierods fastened to the base ring.

The ½-, ⅝- and 1-in. round steel bar or cage reinforcement was made up in coils of about 15-ft. diameter. The ½- and ⅝-in. steel was coiled in lengths of about 450 and 300 ft. respectively, and the 1-in. steel for most of the cages was made up in coils sufficient for one cage, the largest of which contained 1,440 ft. In making up the 1-in. coils, stock steel 90 ft. long was used. The ends were all saw-cut, then butt-welded in a resistance welder and each weld tested. The specified load test was 27,000 lb. per sq.in., but a few welded joints

FIG. 4—TYPICAL SECTIONS and joint, showing steel cylinder and reinforcing.



REINFORCING STEEL AREAS AND LIMITS OF HEAD

Circum. Steel, Per Lin.-Ft., Sq. In.	Limit of Head 3 Ft. Cover (ft.)	Limit of Head 10 Ft. Cover (ft.)
Cage-Type Reinforcement		
...	0	...
1¼	...	...
...	40	...
2	...	...
...	60	0
2¼	...	...
...	68	32
2½	...	...
...	74	55
2¾	...	...
...	80	75
3	...	...
...	85	85
10-Gage Steel Cylinder and Cage Reinforcement		
...	85	...
3¼	...	...
...	93	...
3½	...	...
...	113	...
4	...	...
...	125	85
4¼	...	...
...	...	97
4½	...	...
...	...	116
4¾	...	...
...	...	138

broke while being passed through the coiling roll so that the test load was raised to 35,000 lb. in an endeavor to find all welds that might break in the roll, even though they had passed the specified tension test. Most of the welds were tested under this higher stress.

The assembling of the reinforcing cages was done with the 12-ft. pipe section in a vertical position. Space bars of 1¼x½- and 1½x½-in. channels that had been punched to form projecting tongues at the spacing required for spiraling were set at each 30-deg. point of the circumference and secured in position by welding. A bundle of the coiled reinforcing bars was picked up on four hooks by a crane (Fig. 2) and lowered, encircling the space bars. Each coil was then wrapped around the space bars and secured by driving home the tongue (Fig. 3). Lap joints were made of about 20 diameters, and the laps were welded on all ½- and ⅝-in. coils and also on any 1-in. welded joints that had broken in the coiling machine.

The completed cages with joint rings attached were 12 ft. 4 in. long and 13 ft. 8 in. in diameter, the heaviest weighing about 8,400 lb. They were cumbersome to handle but were rigid due to the many spot welds and the clamping in the tongues of the channels. The cages were shipped in groups of three, lying in cradles crosswise on flat cars (Fig. 1). Trucks were used to transport the cages from the railway destination to the site of the siphon, which was about 7 miles from the railroad.

The casting of the 12-in. concrete shell will be comparatively simple, but the handling and placing of the completed units will be much more difficult, as each unit will weigh about 40 tons. The contractor plans to use cranes and a gantry to handle the completed sections of pipe.

Original contractor on the Little Morongo siphon (Nov. 27, 1933) was the United Concrete Pipe Corp., by whom half interest in the contract was subsequently assigned to the American Concrete & Steel Pipe Co. Construction is under the superintendence of H. H. Jenkins, vice-president of the American Concrete & Steel Pipe Co., who is acting both for his own company and the United Concrete Pipe Corp. in this work.

The district engineering is under the direction of R. B. Diemer, division engineer. All engineering and construction of the Metropolitan Water District of Southern California is under the general direction of F. E. Weymouth, general manager and chief engineer.

Joist Anchors in Masonry Walls Tested for Earthquake Resistance

Investigation indicates that more efficient floor-to-wall assemblies are possible, and points to plate anchors, deeper embedment and use of blocking between joists as detail improvements

By Norman B. Green and A. C. Horner,
Consulting Engineers, San Francisco, Calif.

A SERIES OF TESTS of anchorbolts in masonry walls, intended to aid in the development of better methods for the construction of bearing-wall buildings, particularly in relation to their resistance to earthquake forces, has recently been completed by the writers in the laboratory of Stanford University. The present series, covering the tensile and shearing strength of joist anchors in brick and tile walls, is a part of a more comprehensive test program outlined in *Engineering News-Record*, Feb. 1, 1934, p. 142.

Bearing-wall buildings are dependent for their lateral stability upon three factors: the strength of the bearing walls, the ability of the wood floors and roof (acting as a diaphragm or beam) to distribute lateral forces, and the effectiveness of the connection of the walls to the floors and roof. The problem of the floor and roof structures has been discussed at some length in the above-mentioned article. This article presents test data relative to the strength of the wall-to-floor connection.

The conventional type of joist anchor is a round rod hooked into the side of the joist at the inner end, with a dowel or plate at the outer end set in the masonry. This type of anchor is efficient only in direct tension. A compressive force transmitted through the wall must be resisted by direct bearing on the end of the joist, while a horizontal force parallel to the wall can only be resisted by sidewise bearing of the end portion of the joist against the brickwork, accompanied by lateral bending of the joist.

A much more efficient wall-to-floor connection consists of bolting a timber "ribbon" to the walls parallel to the joists, and bolting solid blocking (cut in between joists) to the walls perpendicular to the joists. There would probably be one bolt used for each cut-in block, with the bolt spacing for the ribbon bearing a proper relation to the forces to be resisted. Diagonal flooring would be nailed to both the ribbon and blocking with sufficient nails to develop the necessary resistance to tension, compression and horizontal forces parallel to the wall. This construction has the added advantage of providing a practically continuous support for the wall, so that lateral bending of the wall between anchors is largely eliminated, and with it also the necessity for a bond beam.

Tensile tests

For the tensile tests, small brick and tile walls were constructed, either 8 or 12 in. thick, with a length of 3½ ft. and a height of 2½ ft. for the brick construction, and corresponding dimensions of 4 ft. 1½ in. by 3 ft. 6 in. for the tile. An anchorbolt was set in a horizontal joint of each wall at the center of the face. In a majority of the tests this consisted of a ¾-in.-diameter steel rod of structural grade, threaded on the inner end and having a 4-in. right angle hook on the outer end set vertically 4 in. in from the rear face of the wall. Plate anchors and T-type anchors, each set 4 in. in from the rear face of the wall, were also tested.

Each anchorbolt was tested (Fig. 1) with the wall in an upright position and supported along its two vertical edges against 6x12-in. reaction timbers. The load, applied by a screw jack, was measured by means of a calibrated spring.

The brick was grade B, wire-cut common, quite hard and of very uniform quality. The tile used was structural clay load-bearing tile having three cells in the 8-in. unit. Two types of mortar were used, as given in Table I. The specimens were laid with full mortar beds (no furrowing) and with the vertical joints filled. In the "grouted

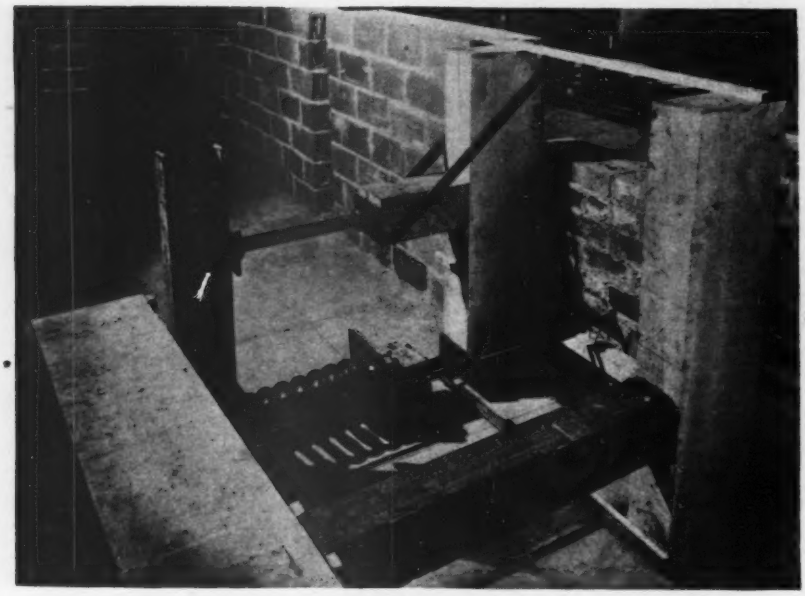


FIG. 1—TEST APPARATUS for measuring resistance to tension of three types of joist anchor in brick and tile walls—namely, with hooked ends, plate ends and T-ends.

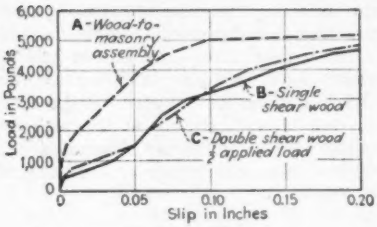


FIG. 2—LOAD-SLIP CURVES for a wood-to-masonry shear-resisting assembly and for all wood assemblies in both single and double shear.

method" (specimen 7) all interior vertical joints were filled by pouring in thin grout mortar.

The results of the pull-out tests are shown in Table I. There were three general types of failure: (1) flexural failure of the wall, (2) what might be termed a shear failure, and (3) bearing failure of the hook. It will be noted that four specimens failed in flexure of the wall, so that the ultimate strength of the anchor itself was not developed. Two of these failures (Nos. 8 and 11) were along a horizontal mortar joint, which may be attributed to the fact that there was uneven bearing between the reaction timbers and the wall. This was prevented in other specimens by the insertion of strips of insulation fiber board. The fracture in specimen 5 occurred along a line of vertical mortar joints near the anchor and showed a clean break through every alternate brick. The clear span was 28 in., which, with the recorded load of 18,400 lb., indicates a modulus of rupture of 180 lb. per sq.in.

Shear failures occurred ultimately by a pulling outward of the brick immediately under the anchor, followed by the displacement of other bricks each side of it and below it. However, before this displacement of the bricks was perceptible the anchor had pulled out from $\frac{1}{16}$ to $\frac{1}{4}$ in., as measured with a steel scale from the face of the brick.

In the bearing type of failure the anchor gradually pulled out, with no external evidence of damage to the wall. The slip at maximum load varied for different specimens from $\frac{1}{4}$ to $1\frac{1}{8}$ in. On breaking up these specimens, the slip was found to be due partly to bending of the hook and partly to bearing failure in front of the hook. In the cases of the tile walls, the hook had actually broken through the shell of the tile.

Tensile-test conclusions

The increase in anchor strength that might be expected from the use of a richer mortar mix or a lower water-cement ratio was not apparent in these tests. In fact, specimens 3 and 4 showed a greater strength for the leaner mortar. While the effect of mortar proportions and w/c ratio may be obscured to some extent by variations in workmanship, it seems unlikely that the anchor strength bears any close relation to these factors.

The effect of the thickness of masonry in front of the anchor hook is evident. It appears that an anchor having 4 in. of masonry in front of the hook develops about two-thirds the ultimate strength of a similar anchor having 8 in. of masonry in front of the hook.

The strength of the 3x3x$\frac{1}{4}$-in. plate anchor proved to be at least twice that of the plain right-angle hook. This plate anchor was the strongest of those tested and showed no measurable slip at the ultimate load, failure being due to a flexural rupture of the wall.

The importance of obtaining solidly filled interior mortar joints was brought out strongly by the bearing type of failure. It was found that there is a distinct gain in the ultimate strength of anchors and a decreased slip at working loads when the joints are solidly filled. Evidence of this may be seen in specimen 7, which developed a very high ultimate strength, and in which the anchor showed no measurable slip up to a load of 8,800 lb.

Shear tests

The purpose of the shear tests was to develop information relative to the single-shear resistance of an assembly consisting of a wood block or steel angle bolted to the masonry and with the load applied parallel to the masonry courses. Hooked anchor bolts, similar to those used in the tensile tests, were employed for the shear tests, the bolts being placed in horizontal mortar joints except for a few supplemental tests in which the bolts were placed in vertical joints to eliminate splitting action.

Three types of assemblies were tested: (1) wood to masonry; (2) steel to masonry; (3) wood to wood (for comparative purposes). In the wood-to-masonry assembly a short block of wood was fastened to the masonry specimen by the $\frac{3}{4}$-in. hooked bolt, having a nut and washer on the outer end.

In the steel-to-masonry assembly a 3x3x$\frac{5}{16}$-in. steel angle approximately 16 in. long was fastened to the masonry by the $\frac{3}{4}$-in. (or $\frac{1}{2}$-in.) hooked bolt. The wood-to-wood assemblies, tested for the purpose of comparison, consisted of a single-shear specimen made of two pieces of wood identical with those used in the wood-to-masony tests, bolted together with a $\frac{3}{4}$-in. bolt, and a double-shear specimen made of three similar pieces of wood bolted together with a $\frac{3}{4}$-in. bolt, the two side pieces being identical with those used in the wood-to-masonry tests and the center piece of the same material, but twice as thick ($5\frac{1}{4}$ in.).

All shear test specimens were placed on end in the testing machine, loaded at the rate of 0.05 in. per min., and deflections were read on an Ames dial.

After a few specimens had been tested, it became evident that those assemblies having the bolt in a horizontal mortar joint developed the full strength of the mortar in compression under the bolt and that the resistance offered to transverse splitting was adequate until after the mortar had failed. Consequently the remaining tests were made on bolts placed in horizontal joints.

In order to aid in the interpretation of the test data and to arrive at a basis for designing anchorbolts, Fig. 2 was constructed in which a typical load-slip curve for a wood-to-masonry assembly having a bolt in the horizontal joint is compared to load-slip curves for wood-to-wood assemblies. Curve A is the load-slip curve for specimen 16, Table

II. It will be noted that up to a load of about 1,500 lb. the slip is very slight, and it is likely that during this period there is little or no crushing of the mortar under the bolt, so that the bolt bends as though very nearly fixed at the face of the masonry. Between 1,500 and 5,000 lb., the curve is closely enough parallel to curves B and C for the wood connections to indicate a progressive crushing of the mortar under the bolt accompanied by the crushing of the wood and bending of the bolt. In other words, during this phase of the action the bolt bends in much the same fashion as for a wood-to-wood assembly. When a load of about 5,000 lb. is reached, curve A flattens out sharply, and then almost immediately the ultimate strength of the assembly is reached at about 5,200 lb. The action during the final phase may be attributed to disintegration of the mortar under the bolt due to the reduction in lateral restraint caused by incipient splitting of the specimen. This relatively abrupt failure of the wood-to-masonry assembly is unlike that of the wood-to-wood assemblies, which took load steadily but very slowly and finally attained an ultimate strength of about 7,000 lb.

In Fig. 2 it will be seen that a given load will produce much less deflection in the wood-to-masonry assembly than in the wood-to-wood assembly, especially for loads within and somewhat above the working limits for each. If current methods of designing bolted timber joints are used, the safe allowable load on the wood-to-wood assembly would be about 1,000 lb. At this load the wood-to-masonry assembly shows no appreciable slip, which is of importance since it insures a very rigid connection and avoids the possibility of permanent damage to the assembly under repeated or reversed loads.

In the absence of a larger number of tests of the shear resistance of anchorbolts in wood-to-masonry assemblies it is believed that a very conservative basis for the design of such connections may be found in the use of present recommended practice for timber joints as outlined in Technical Bulletin No. 332, "The Bearing Strength of Wood Under Bolts," published by the U. S. Department of Agriculture. Assuming that the wood blocking (or ledger) of the wood-to-masonry assembly is comparable to the *side* member of a bolted timber joint and that the masonry itself takes the place of a wood center member, and remembering that a bolted wood joint in single shear is one-half as strong as in double shear, Bulletin No. 332 provides all of the necessary information for the design of a wood-to-masonry assembly. For a 3-in. wood block bolted to a masonry wall with a ¾-in. anchor-bolt, the safe load calculated as above would be 1,085 lb.

The ultimate strength and the load-slip relation for the wood-to-masonry assembly may be affected by variables such as kind of masonry, mortar mix and wall thickness, so that caution should be exercised in applying the above conclusions beyond the range of these variables as covered in Table II. With regard to the influence of the first variable, the kind of masonry, it will be seen that the brick specimen 6 developed the same ultimate strength and the same load at 0.05-in. slip as was developed by the tile assembly 16. Specimen 16, having a 1:½:4½ mortar, gave a considerably higher ultimate strength and slightly less slip at lower loads than specimen 15, which had a 1:1:6 mortar, although this increase in strength is not proportional to the increase in mortar strength. So far as the effect of wall thickness is concerned, it seems unlikely that an increase beyond 8 in. will have much effect upon the strength of the bolt in shear, since the bending of the bolt in the wall and the crushing of the mortar are both confined to the outer 2 or 3 in. of its length of embedment. This conclusion is supported by a comparison of the test results for specimens 5 and 6, which each developed exactly the same ultimate strength, although the former was 12 in. in thickness and the latter only 8 in.

TABLE I—TENSILE STRENGTH OF ANCHORBOLT ASSEMBLIES

Specimen Number	Wall Type	Wall Thickness In.	Type of Anchor	Age of Specimen, Days	Mortar Mix	Mortar Water Cement Ratio, Gal./Sack	Ultimate Load, Lb.	Type of Failure
1	Brick	12	¾" rd.x4" hook	92	1:1:6	12.7	11,200	Flexure
2	"	12	"	96	1:½:4½	9.9	9,200	Shear
3	"	8	"	96	1:1:6	12.7	6,600	"
4	"	8	"	96	1:½:4½	9.9	5,600	"
5	"	12	3x3x¼" pl. & ¾" rod.	89	"	9.5	18,400	Flexure
6	"	12	¾" rd.x 4" hook	89	"	9.5	7,200	Bearing
7	"	12	¾" rd.x 4" hook	95	"	Grout Method	14,400	"
8	"	12	¾" rd.x10" T	95	"	11.3	8,600	Flexure
9	Tile	12	¾" rd.x 4" hook	91	1:1:6	12.2	9,400	Bearing
10	"	12	"	91	1:½:4½	9.4	9,400	"
11	"	8	"	91	1:1:6	12.9	3,200	Flexure
12	"	8	"	91	1:½:4½	9.4	5,300	Shear

TABLE II—SHEAR TESTS OF ANCHORBOLTS

Specimen No.	Wall Type	Wall Thickness	Type of Connection: Bolt Size, In.	Position of Bolt	Angle or Block	Age of Specimen, Days	Mortar Mix	Mortar W/C Ratio Gal./Sack	Yield Point Load, Lb.	Yield Point Slip, In.	Load at 0.05" Slip, Lb.	Ultimate Load, Lb.
1	Brick	12	¾	Hor. jt.	3"x3"x5/16"	93	1:1:6	11.3	5,000	.037	5,000	8,500
3	"	8	¾	"	"	93	"	11.3	6,250	.050	6,300	6,700
12	"	12	¾	"	"	94	1:½:4½	Grout Method	6,500	.028	7,100	9,500
11	"	12	¾	"	"	119	"	9.8	4,500	.036	4,850	5,800
7	"	12	¾	Vert. jt.	"	93	1:1:6	11.3	.....	.....	4,500	8,650
5	"	12	¾	Hor. jt.	2¼"block	94	1:½:4½	9.8	.....	.....	2,800	5,000
6	"	8	¾	"	"	94	"	9.8	.....	.....	4,000	5,000
2	"	12	¾	"	"	89	"	11.3	.....	.....	.....	6,150
10	"	8	¾	Vert. jt.	"	94	"	9.8	.....	.....	1,900	4,660
17	Tile	12	¾	Hor. jt.	3"x3"x5/16"	96	"	9.3	.....	.....	2,100	6,000
18	"	8	¾	"	"	119	"	9.8	5,500	.025	6,250	7,000
13	"	12	¾	"	"	94	1:1:6	11.3	4,500	.050	4,400	5,250
14	"	12	¾	"	"	118	1:½:4½	9.3	5,750	.050	5,700	6,000
19	"	12	¾	"	5½" block	119	1:1:6	11.3	.....	.....	2,900	4,500
15	"	8	¾	"	"	119	"	11.3	.....	.....	3,500	4,350
16	"	8	¾	"	2¼" block	94	1:½:4½	9.8	.....	.....	3,800	5,150
22	"	8	¾	Vert. jt.	"	94	"	9.8	.....	.....	2,700	3,600

In Table II are also listed the specimens that were tested with a 3x3x⅜-in. steel angle. The behavior of the steel-to-masonry assemblies was quite different from that of the wood-to-masonry assemblies in that a definite yield point, higher ultimate strength and less slip were obtained. This difference was due in part to the difference in crushing resistance of the steel and wood specimens, and in part to the fact that the use of a steel angle places less bending moment on the bolt.

General conclusions

(1) Anchorbolt assemblies, as described herein, can be rationally designed so as to provide an adequate tie between wood floors or roofs and masonry bearing walls subject to earthquake or wind loads. Factors affecting the adequacy of such assemblies are:

In both tension and shear:

Size, strength and spacing of anchorbolts.
Quality of mortar.
Type of masonry.
Thickness of wood blocks or ribbon and nailing of flooring or sheathing thereto.
Size of washer between nut and wood member.
Movement of anchorbolt under design loads.
Quality of workmanship in laying masonry and placing bolts.

In tension only:

Size and type of anchor, i.e., hook, plate or dowel.

Thickness of masonry in front of anchor hook.

(2) Data resulting from the tests reported herein together with engineering information otherwise readily available may be used as a basis for such design with due attention to the number of tests made.

(3) Further tests are needed to corroborate the results thus far obtained.

(4) Anchorbolts placed in vertical mortar joints do not give any more strength to an assembly than anchorbolts placed in horizontal mortar joints.

(5) Deflections likely to be produced by earthquake or wind loads in assemblies described herein will not be excessive. The use of properly designed assemblies with properly designed walls will provide assurance that walls and floors will act as a unit under earthquake or wind loads so that wall failure due to inadequate lateral support may be avoided in the future.

Large Concrete Structure Launched Like a Ship

Weighing 530 tons, the box-like structure comprising an inlet well and pump house, destined for an offshore location, was built on ways, slid into the water and towed 3 miles to its site

By John G. Ahlers

Barney-Ahlers Construction Corp., New York, N. Y.

A BOX of reinforced concrete, 32x52 ft. and 16 ft. high, comprising an inlet well and the foundation and lower part of a pump house at the Grasselli Chemical Co. plant at Grasselli, N. J., was recently constructed by a somewhat unusual method: built ashore on launching ways, it was slid into the water and towed 3 miles to the plant site, where it was sunk into position on previously prepared timber-pile supports. The exact limitations as to size, purpose and general design were laid down by the owner's engineering department, but latitude was given the contractor as to methods of construction.

The site of the pump house had uncertain foundations of clay and river silt on the edge of the Kill van Kull, which dictated the use of piling. The use of a cofferdam for construction was not considered practical because of danger from blowouts, since the bottom of the structure was to be placed 19 ft. below high water, which would cause an upward pressure of 1,200 lb. per sq.ft. The launching method was therefore adopted, although it called for careful study in handling a 530-ton structure in the shape of a large concrete barge.

Preparing the site

The nearest available site for building the box was a sandy beach 3 miles down the Kill from the plant, on the opposite, or Staten Island, shore. Here the beach was prepared from 20 ft. above high water out to deep water. A slope of about 6 per cent was selected, to avoid too much dredging, although a hole about 17 ft. deep below high water was dredged at the point where the front end of the box would take its maximum dip as it was being launched. This preparation of the bottom gave a draft of 7 ft. at the edge of the channel, and the box was calculated to float at 10½-ft. draft.

The launching ways were a problem in themselves. The original design on which the concrete box was formed and poured consisted of steel rollers between five sets of steel-clad skids. However, when it came to launching the box, an old shipbuilder, who was called in to put the craft afloat, refused to assume responsibility unless the old standard type of greased ways was used. These ways were added as shown in Fig. 4.

A plank bottom was built on top of the five steel-clad skids. This planking was 3 in. thick and was left in place to act as a cushion on the pile foundation. The remainder of the formwork and the reinforcing followed conventional lines except that all interior forms had to be suspended from the top, as no wood or steel were permitted to extend through the concrete bottom of the structure. The total yardage in the floating box was 256.

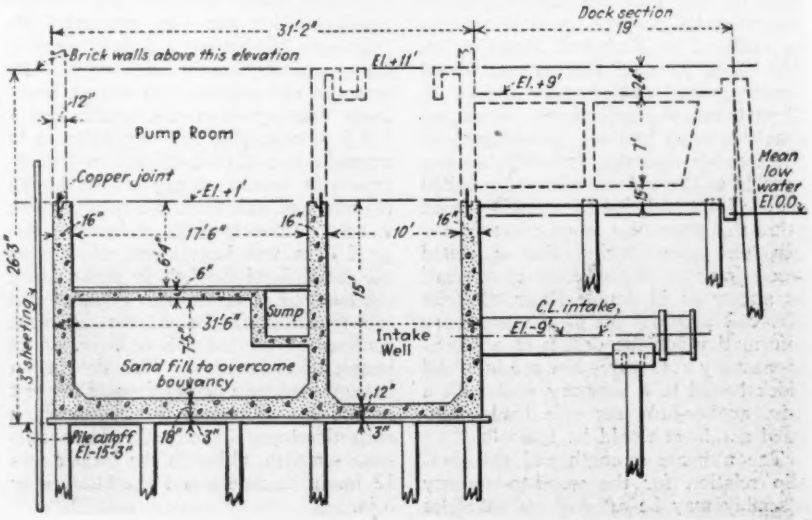
In order to insure homogeneous concrete it was decided to pour the box in one day. To this end a plant was set up on an adjacent dock and consisted of a 1-yd. clamshell crawler crane for handling the dry materials, a 1-yd. concrete mixer placed under a charging hopper and a 3-ton crawler crane, with a 40-ft. boom, for hoisting the 1-yd. bucket up and over the forms for the structure.

As the bottom of the box was 3½ ft. under water at the outer end at high tide, concreting had to begin at low tide and proceed fast enough to keep ahead of the rising water and to let the concrete set sufficiently to resist a 180-lb. per sq.ft. upward pressure in six hours' time. The mixed concrete was dumped into the hopper and from there wheeled by buggies to the walls. No concrete was chuted or dumped in mass into the forms. A gang of men worked continuously spading and ramming. Concreting started at 4:30 a.m. and was completed by 6:30 p.m.

The concrete was designed for 3,000 lb. at 28 days, using a constant water-cement ratio but oversanding the mix, to promote workability and to insure density. The aggregates had been unloaded the day previous from a barge to the dock into two large storage piles and therefore were relatively dry.

Forms were removed in three days, and the inside of the pump chamber was waterproofed before launching. At

FIG. 1—LAUNCHED AS A SHIP, the box (indicated by heavy lines) formed the foundation for the intake well and pump house.



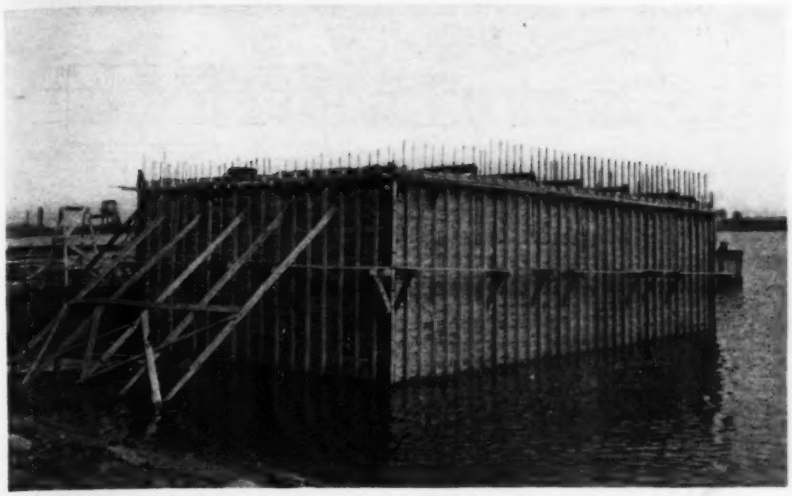


FIG. 2—FORMS for the box structure being built 3 miles from the plant site on a sandy beach, under water at high tide.

seven days the concrete tested 2,000 lb., and at fourteen days it was considered safe to start launching.

Launching

As previously stated, new ways of 14x14-in. timbers were installed from the outer end of the box to the edge of the channel. These were framed together afloat and sunk into place at low tide. This work was very difficult, as the final alignment and bedding had to be done partly under water. At the outer end a dredge removed the bank until a 12-ft. clear depth at low tide was available from the channel shoreward to the launching point.

The draft and balance of the box were carefully calculated; but, as a check, a model was built on a 1:12 scale. Wire mesh and good cement grout made a duplicate model that would behave in all respects like the larger structure. This model was launched on ways at various tide levels, and particular note was made as to any scraping of the bottom at the outer end of the ways, also as to draft and tendency to dive. All test results checked the calculations, and it was found that the greater the speed of launching the less tendency there was for water to wash over the front end of the box. As a precaution, however, a splashboard 4 ft. high was built in front and for a distance of 8 ft. back from the corners; such a splashboard was also considered advisable to prevent wash during towing. Enough ballast was placed to bring the box level when afloat, and bulkheads were built to prevent foundering in case of some wash.

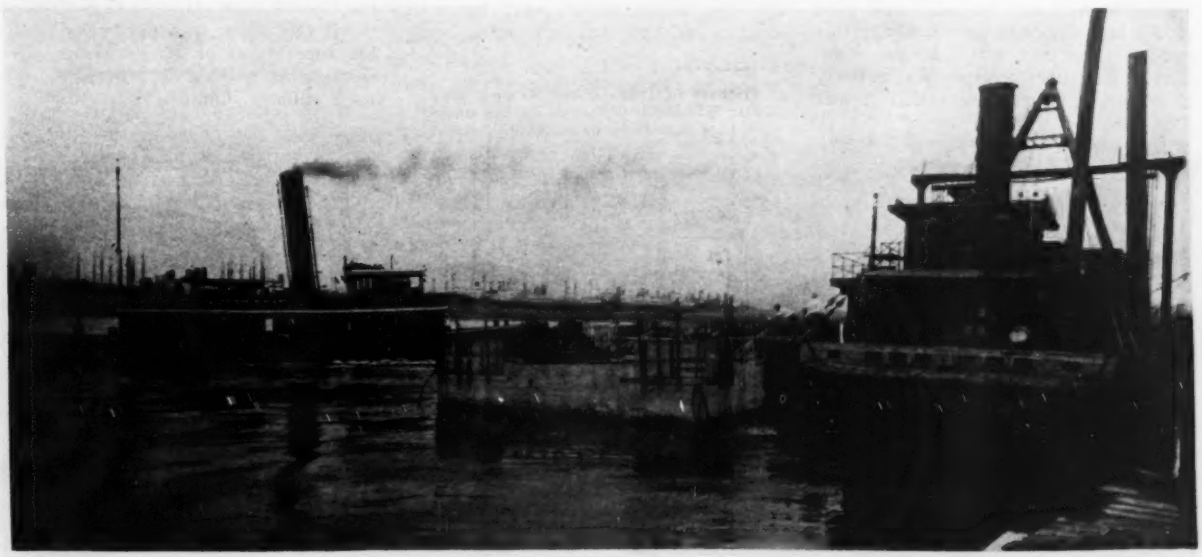
The transfer from the rollers to the greased ways was done in stages. A slot was left between the steel roller ways and the greased ways, to permit the rollers to run off. Inshore, hydraulic jacks were installed to push against 12x12-in. timbers at the stern of the box, to overcome initial friction. Outshore, a dredge was tied at the end of the dock and provided a 50-ton pull on shackles built into the bottom of the concrete box. Towing and pulling hooks fashioned out of 1¼ dia. reinforcing rods had also been built into the top of the box.

After one unsuccessful launching attempt in which the box was moved about 20 ft. and jammed the skids and rollers in the ways, an unusually high tide immersed the box 7 ft. at the bow, and a passing steamer set up a good swell and surge so that in spite of a parted hawser and a lost jack, the box slid out. No water was shipped, and the action was exactly as predicted from the model studies. Minor leaks developed around the bulkheads over the intake pipe sleeves, but these closed up on swelling of the lumber and after ashes had been dumped alongside. The forms, tools and tackle were placed aboard, and two days later the craft was towed to the plant site.

While the box was being built, the site of the pump house at the Grasselli plant had been prepared. The area was dredged in the wet and wood sheathing driven 2 ft. clear of the outside of the concrete box but open to the river. This sheathing was driven 4 ft. below the cutoff elevation of the piles and held in place with one waler at the top. Accurate level lines were taken on the bottom of the concrete box before it was launched, and the piling was driven and cut to conform to these levels.

After the box was maneuvered inside the sheathing and while it was still afloat, forms and steel for the second lift of concrete were placed and the

FIG. 3—CONCRETE BOAT, in reality an intake and pump-house foundation, being towed to its final location, where it was sunk onto a foundation of timber piles.



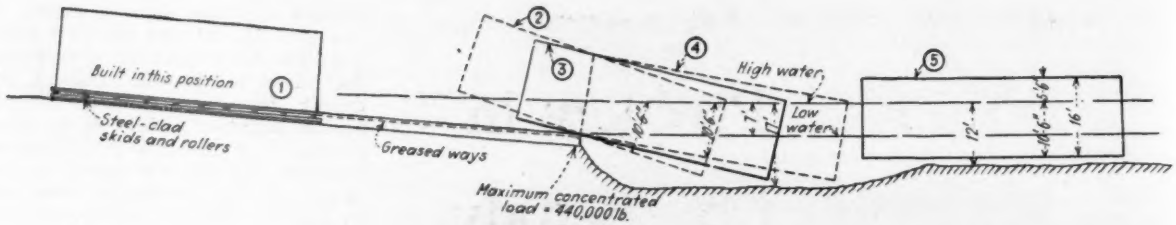


FIG. 4—BOX-LAUNCHING procedure, showing successive positions of the structure as it slid into the water.

copper sealing strips soldered and straightened. Concreting then began, but because the box was of unequal weight on the two sides, only a part of the concrete at the heavy side could be poured. There was a decided tendency to list and, to avoid danger, the box was flooded during the time the concrete was curing. One unusually high tide actually tilted the box 1½ in., but this was corrected by pumping out the low side and weighing the top down with some of the new machinery that had arrived.

Also the buoyancy of the box was so great that special precautions had to be taken to hold it down on the piling. A sand fill was placed below the pump floor and, in addition, the intake chambers were kept filled with water until the second lift of concrete was entirely complete. The pump-room side was then flooded and the intake well pumped dry, so that the concrete wings holding the guides for the screens could be poured. The entire structure was not unwatered until the loads of screening machinery and brick walls with craneway and roof were in place.

The building houses fire pumps for the protection of the plant, and, these pumps being below mean tide level, it was considered best to waterproof the interior of the pump room with a two-coat cement waterproofing on the walls and floor.

All of the work outlined was done under the supervision of H. T. Daniels, of the engineering department of the Grasselli Chemical Co. The contractors were the John William Contracting Co., Inc., and Barney-Ahlers Construction Corp. For the contractors, the design and construction were handled by A. V. Bekay and A. M. Brothers.

Timber from Famous Old Bridge Used Again After 100 Years

By E. J. Salsinger
Ohio Department of Highways, Sidney, Ohio

LAST YEAR it became necessary to remove the last wooden covered bridge on the National Road, U. S. Route 40, in Ohio. This bridge, built 95 years ago, and designed for light traffic, had become so weakened from the heavy modern traffic to which it was subjected that it had become dangerous. It was replaced by a steel-beam and concrete structure.

Built in 1837 and located 1 mile west of Springfield, in Clark County, this wood bridge was an historical landmark. The superstructure was entirely of timber, and upon inspection it was found that a large percentage of the timber was remarkably preserved and well worth salvaging. The entire bridge contained about 130,000 ft.b.m. of lumber, largely poplar and oak. The structure consisted of three latticed trusses, 180-ft. span, made up of 4x12-in. yellow poplar, fastened together with hickory pins. The floor system was of oak beams and stringers. The center truss separated traffic into two 8-ft. lanes, which was one of the main hazards.

The bridge was carefully dismantled and the lumber sorted, only the roof shingles and the weatherboarding being discarded as of no value. Except where the hickory pins had been placed, causing slight cracks in some instances, the timber was in excellent shape, close grained, perfectly straight and with no defects. The salvaged lumber was hauled to the state highway division yard, where about 30,000 ft.b.m. was milled up into boards, from which office desks, cupboards, file cabinets, etc., have been made; also railing spindles for timber bridges, as well as several small timber bridges for secondary roads. In all, about 80 per cent of the lumber used in this bridge nearly a century ago has again been placed in service.

A model of this old bridge to 1/300 scale and made up from the old lumber was exhibited at the Ohio state fair this year, and was then presented to the Clark County Historical Society.

All this work was performed under the supervision of H. C. Miller, division engineer, Ohio department of highways, Sidney, Ohio.

TIMBER BRIDGE on old National Road near Springfield, Ohio, and the new structure that has replaced it.

Aerodynamics and the Civil Engineer—II

Vibration Problem in Tall Stacks Solved by Aerodynamics

Analysis of data on deflections, wind velocity and direction and eddy frequency dictated use of new trusses in supporting structure and ring stiffeners in stack with crossed diagonals

THIS SECOND ARTICLE on the general subject of what aerodynamics can teach the civil engineer presents a practical application of the fundamentals developed in the first article, which was published in the March 15, 1934, issue, p. 348. Much of the first article was devoted to the subject of flow conditions about cylinders, so that this discussion of a problem of eliminating wind vibration in a pair of cylindrical stacks follows quite logically. —EDITOR.

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IN THE YEAR 1929 the writer had an opportunity to apply some of the aerodynamic data outlined in the first article of this series (*ENR*, March 15, 1934, p. 349) to an unusual case of vibration in the two stacks of the first unit of the Gould St. Station of the Consolidated Gas, Electric Light & Power Co. of Baltimore. This station, located at Port Covington on the north bank of the Patapsco River, is in a position exposed to all winds. The stacks are 140 ft. high and 11 ft. in diameter above the 30-ft.-high bell base, whose bottom diameter is 18 ft. The shell plating is $\frac{7}{16}$ in. for the top 16 ft., $\frac{1}{2}$ in. for the next 30 ft., $\frac{9}{16}$ in. for 31 ft. and $\frac{5}{8}$ in. for the remainder and the bell base. There was no stiffening of the plating. The stacks rest directly on the roof structure whose plan is shown in Fig. 1. Their supports were designed for 22.5 lb. per sq.ft. of projected diameter, and the stacks are spaced 48 ft. c. to c. and stand on a line parallel to the center line of the building at N. 46 deg. 21 min. W., or approximately northwest-southeast.

Observed vibrations

After erection of the stacks it was found that during north and northwest winds of appreciable velocity there was a swaying of the leeward (No. 1) stack. In a particular wind the east girder (*E* in Fig. 1) showed a vertical double amplitude of about $\frac{1}{2}$ in., i.e. from $+\frac{1}{4}$ to $-\frac{1}{4}$ in. The wind was somewhat west of northwest, because the smoke from stack No. 2 was barely passing the east side of stack No. 1. If the outer boundary of the smoke was 8 ft. from the center line when passing the second stack, the angle of the wind to the building center line was about 15 deg. This would indicate that for winds from N. 61 deg. W. and N. 31 deg. W. there should be vibrations in stack No. 1, and for winds from S. 61 deg. E. and S. 31 deg. E. there should be vibrations in stack No. 2.

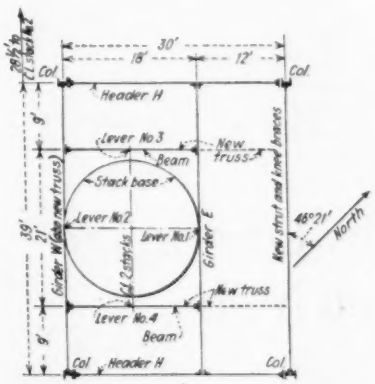


FIG. 1—Structural layout at base of stacks, showing levers used to record deflections and new members added to eliminate vibrations from wind.

For winds of less than 30 m.p.h. only slight tremors were observed, even with apparatus having a magnification factor of 10:1. The probable "static deflection" of the structure for a steady 60-m.p.h. wind was 1/50th in. If dynamic impulses, or a harmonic disturbing force, of this strength should act for a sufficient period, the forced vibrations of the assembly would approach infinity, except for the damping effect of friction and negative forces. The actual observed amplitude was only about twelve times the static, and this relatively small value may be attributed to two elements: (1) damping forces, and (2) lack of continuity of the disturbing wind force. Illustrating the latter point, when the wind direction remained constant or nearly so for a few seconds, the oscillations built up; but when the direction was itself oscillating, or not suitably aligned, there were no appreciable vibrations. However, an exception appears in Fig. 2.

The problem to be solved

The mathematical computation of the vibration of even a simple beam subjected to a harmonic disturbing force, either concentrated or uniformly distributed, is not simple. Two kinds of vibrations are set up, natural and forced; and in proportion as the damping effect is large or small, the former are more or less quickly reduced to a small amount, in proportion to the logarithmic decrement of the system. When, however, there are several degrees of freedom (e.g., the flexible bending of the stack itself, the flexible bending of each of the supporting beams, and the swaying even of the building as a whole) and when in addition the disturbing force is variable in direction, intensity and period, the problem becomes almost impossible of exact solution.

It was apparent from the first that the disturbing force was a simple harmonic function whose frequency was proportional to wind velocity and whose intensity was a function of the velocity squared. Thus any mere change in weight or moment of inertia (such as is sometimes made, to eliminate vibrations) would only change the period of the stacks and the structure to a value that might conceivably synchronize with a lower velocity. Similarly, partial stiffening of the roof might cause synchronism with some higher velocity, and only make matters worse.

Recording equipment

The company possessed most of the apparatus needed for the necessary investigation. Four 10:1 leverage systems were prepared and installed on the principal axes of the stack, as shown in Fig. 1. An anemometer and wind-direction meter were then installed, and readings from all six instruments were electrically recorded simultaneously on a 6-in.-wide film.

The system was put into effect without previous trials, and some of the levers failed to operate at times, but the necessary information was obtained. The records of levers 1 and 2, the wind velocity and the wind direction are given on Fig. 2. The time scale was determined separately and marked on the film. Actual deflections are given in inches, the wind direction by a scale consisting of the four cardinal points,

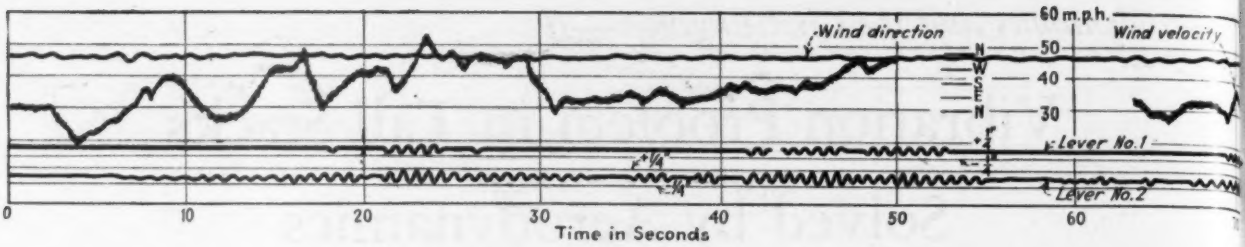


FIG. 2—Simultaneous readings of deflections (by levers), wind velocity (by anemometer) and wind direction (by direction meter) on Gould St. Station stacks. Records of levers 3 and 4 are omitted for the sake of clarity.

N, E, S, W, and wind velocity in miles per hour.

The record reproduced in Fig. 2 is the best one obtained, since all parts of the apparatus were working simultaneously and at a time of heavy swaying. It will be noted that the velocity was varying from about 30 to 53 m.p.h. in sharp gusts and that the direction of the wind was slightly west of north. Levers No. 1 and No. 2 were recording smooth curves, which of course were 180 deg. out of phase, and which were maximum for the 53-mile wind. There seems to be little connection between gust velocity and wind direction, for example, the latter being almost uniform at time 103-110 sec., while the velocity increased by 20 m.p.h.

Analysis of the readings

Application of the theories of frequency, circulation, drag, etc., given in the first article was made to the data obtained. It was first necessary to consider eddies, for it was noticed that smoke whirls were completely formed at about half the distance to the leeward stack and then passed off in staggered arrangement. Some understanding of eddy frequency, which was not discussed in the first article, is required to analyze this condition. For example, Karman studied the two lines of vortices shed behind a cylinder and showed that these are mathematically stable in only one staggered configuration. He found the longitudinal spacing in each row to be 4.76 times the width between the centers of the eddies in the two rows. Lock analyzed Karman's results and found the spacing in each row to be $4\frac{1}{4}$ times the diameter of the cylinder. Relf made extensive tests and found the frequency to be about $0.27\ V/D$, where V is in m.p.h. and D is in feet, for values of R (Reynolds' Number) between 1,000 and 100,000, or up to the critical range, and to rise to nearly twice this value as the drag curve falls away. (See *ENR*, March 15, 1934, Fig. 2.)

The frequency and the curve for drag correlated well in this range, indicating a close relationship between the two, below and perhaps above the critical region, and even within it. Dryden and Heald found a doubling of the frequency above the critical region. Relf believed that the eddies are *aperiodic* above the critical region, but *periodic* below. Fage and Johansen found a frequency for flat plates of about $0.22\ V/D$.

Below the critical region, therefore, it would be proper to assume that a cylinder sheds eddies with a frequency of $0.27\ V/D$, and above it with a frequency of $0.55\ V/D$. Since an 11-ft. dia. cylinder in a 53-m.p.h. wind has $R = 5{,}500{,}000$, it is well above the critical range. The frequency would be $0.55\ V/11 = V/20$, the number of eddies in one row that will pass in one second. But the observed frequency was about $V/40$, or the same as below the critical range, a seeming inconsistency.

In spite of Relf's opinion that in the higher range the eddies are aperiodic, there was no indication that the smoke whirls were anything but periodic.

According to Karman's analysis, the eddies would be spaced 47 ft. on centers in each row, which is nearly the stack spacing. Observation of the smoke whirls seemed to verify this spacing. The theoretical frequency would then be $V/40$, for V in m.p.h., and frequency in number per second in each row; which gives 1.33 at 53 m.p.h.

Since it subsequently developed that 1.33 was about the frequency of vibration of the stacks and roof structure, it would be expected that a velocity of 53 m.p.h. would cause swaying. That the greatest observed effect occurred for 53 m.p.h. seemingly indicates that Relf's results, modified perhaps, may be extended beyond his range of observations. At velocities nearly equal to 53 there would be considerable vibration of less amplitude. Fig. 4 gives some synthetic curves of this nature in which the impressed frequency and the natural frequencies differ in the ratios noted, viz., 7/8, 11/12 and 15/16.

Eddies around the stacks

The nature of eddy formation is such that the impulses on a cylinder are normal to the wind direction. The singing of a wire is the result of the oscillating flow that is due to these eddies. The vorticity leaving stack No. 2, in so far as it could be judged from the smoke pattern when looked at from below, was largely symmetrical until it reached

FIG. 3—FLOW PATTERN of wind over plant, showing probable eddy formation that caused leeward stack to vibrate from a periodic lateral force.

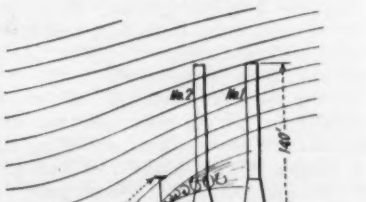
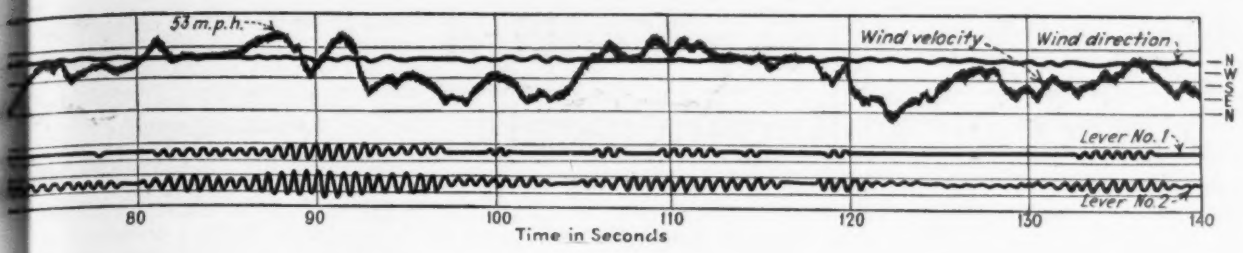


FIG. 4—PERIODICITY of natural and forced vibrations at near synchronism.

Static deflection
m/p = 7/8
m/p = 11/12
m/p = 15/16
Zero time
Frequency of disturbing force = m/2π
Frequency of natural vibrations = p/2π
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Scale of time, t, in multiples of π/p



about half way to stack No. 1, where it formed into discrete eddies. This may explain why the leading stack did not sway.

When the eddies reached stack No. 1, they were fully formed, as shown by the smoke whirls; and, being of opposite rotation to those forming on stack No. 1, near side, they naturally neutralized the vorticity here. This left stack No. 1 with eddies forming only on one side, with no doubt therefore of a periodic lateral force.

Another point of view is that the eddies from stack No. 2 each successively enveloped the leeward stack with a circulation that imposed a periodic lateral "lift," in the same manner as the Flettner rotor ship obtained its propulsive force. In any event there is an effect transversely to the building, and since the structure is softer and in synchronism in this direction, only the winds considered above are likely to produce vibrations.

In connection with the effect transversely of the building, it may be noted that the west girder, *W* (Fig. 1), is supported directly on columns whose strains, being small, could be neglected. The east girder, *E*, had not only its own deflections but those of the headers *H*, which added about 30 per cent. The column strains were neglected. Swaying of the stacks fore and aft caused reversed bending in girders *E* and *W*, for which they were quite rigid and for which their frequency was 2, or about an 80-m.p.h. wind. The headers, *H*, had plus and minus simple deflections. The stacks themselves were flexible cantilever beams with a periodicity in tune with an 80-m.p.h. wind; but with the roof structure stiffened (as later described), their total deflection would be slight. Also the weight of stiffener rings (noted below) was found to increase the period of the stacks about 5 per cent.

Vibration correction

Ovaling—Both stacks were observed to flatten out periodically in the upper portion. When stack No. 1 was measured, it was found to be overstrained and 2 in. out of round. The theory of the ideal fluid, illustrated in the previous article, shows high suction at 90 deg. and pressure at 0 and 180 deg. The shell had a periodicity for ovaling of 1.9 per second for a ¼-in. plate and 2.30 per second for a ⅜-in. plate. The observed frequency was about 11 in 5 sec., or 2.20 per sec., indicating a close agreement.

To prevent ovaling, the writer designed and installed ring stiffeners with a pair of crossed diagonals, placed near the top of the stack and at intervals below. The design of these ring stiffeners was based upon the full suction required by the ideal theory, which was on the safe side.

Structure Stiffening—In addition to the use of these stiffener rings, two other methods of eliminating the vibrations were possible: (1) increasing the damping effect; and (2) making the structure more rigid so as to place it beyond the possible range of wind effects.

Machines that vibrate badly can be placed on springs whose period is that of the disturbing force, in which event the natural vibrations soon damp out and the forced vibrations are taken up by the springs; or they may be placed on absorbing pads which dissipate the impulse energy.

Neither of these methods was found to be practicable in this case, but a comparable method which was considered involved the use of a system of light guys, to absorb each impulse. However, the size of rope required seemed prohibitive, and some strengthening of the roof would have been needed.

The adopted scheme consisted in installing trusses above the roof, secured to the existing beams and girders, whose frequency was specified as "not less than 8 per second." This determined their moment of inertia, but because of structural complications this figure was not quite reached. However, assuming that the frequency at high Reynolds Numbers continues to follow the rough equation given above, then at 160 m.p.h. (certainly the highest gust attainable in Baltimore) the frequency would be 4, thus providing a reasonable factor of safety.

It was assumed that the damping effect would be the same as before. On such a basis it was computed that the maximum amplitude of vibration for 60 m.p.h. would not exceed 1½ times the static deflection, as compared with the 12 times that was recorded for 50-60-m.p.h. winds. At 90 m.p.h. the magnification would be only 2.1 times.

Results of alterations

The rings were first installed and showed a complete rectification of ovaling and also some effect on swaying. The trusses were then installed, very nearly as specified. Since completion, there have been numerous high winds, and the company has often connected up the instruments to record the vibrations. But to date, only slight tremors have been found, and these without periodicity, indicating apparently that the effect that had been observed was correctly apprehended and adequately rectified in the later installation.

Car-Ferry Dock for 23-Ft. Tide Being Built on English Channel

A DOCK for car-ferry steamers, that was made necessary by a tidal range of 23 ft., is an unusual and interesting structure being built at Dover, England, by the Southern Railway for the new cross-channel service between Dover and Dunquerque, France. Such a variation of tide level makes the ordinary hinged apron quite inadequate as a connecting link between the ship and the shore.

For steamers 360 ft. long and 63 ft. wide, the dock will be 416x72 ft., with its inner end shaped to the outline of the hull, which will thus be held steady while the ship is being loaded and unloaded. An electrically operated apron will provide for slight variations in elevation between the ship's deck and the shore tracks. At the outer end will be two lock gates, one serving as a guard gate, but the depth of water on the sill will permit of boats entering and leaving the dock at any stage of the tide, the water level within the dock being adjusted rapidly by powerful pumps.

Both freight and passenger cars will be carried on the four tracks of the steamer, and ample cabin accommodations for passengers will be arranged on the upper deck covering the train deck. Three car-ferry steamers are being built, and it is expected that operation will be begun in September, 1934.

Norris Dam Design Modified to Meet New Requirements

Navigation features entirely eliminated, spillway changed as to character and location, and power plant reduced in size—Elevation of spillway crest lowered

CHANGES in the use to which the water stored in the reservoir formed by Norris Dam on the Clinch River in Tennessee is to be put and further study of the meteorological data of the Tennessee River Valley have resulted in important changes in the design of the dam from that proposed by the Corps of Engineers of the U. S. Army in its comprehensive study covering navigation, flood control, power development and irrigation of the entire valley, completed in 1930. A summary of that report was published in *Engineering News-Record*, May 11, 1933, p. 579, following the passage by Congress of the act creating the Tennessee Valley Authority and assigning to it the coordinated development of the natural resources of the Tennessee River and its tributaries.

Construction of Cove Creek Dam (now called Norris Dam) was the only construction operation specifically provided for in the act creating the Tennessee Valley Authority. At that time the only design for the dam was that prepared by the army engineers. It had been worked out in more detail than had the design of most of the other dams proposed in the report because it had been recognized for a long time that the Cove Creek Reservoir, on account of its large capacity, was necessary to any plan for development of the river and, therefore, should be among the first works to be built. The principal elements of that design were described in our issue of May 11, 1933, p. 583. It calls for a straight gravity-section nonoverflow dam 240 ft. high above the streambed, with a power house located just below the dam at one side of the channel and a barge lift at the other side. A spillway was provided through a shallow section of the dam on a spur that forms its east abutment. The overflow was to be returned to the river through a paved channel down the southerly slope of the spur at a point some distance below the dam, where the flow would have the minimum effect upon navigation.

The dam now under construction is being built at the site selected by the army engineers, but the design has been changed materially. It is the result of a study begun by the engineers of the U. S. Bureau of Reclamation soon after the Tennessee Valley Authority was organized, and continued by them in cooperation with the engineering forces of the Tennessee Valley Authority since organized. Included among the Bureau of Reclamation studies, was one on the economic height of the dam, based on an analysis of the rainfall and runoff record of the Tennessee River basin. It resulted in a decision to lower the crest of the permanent spillway from El. 1032 to El. 1020 and to lower the top of the crest gates from El. 1050 to El. 1034. The level of the maximum flood surcharge of the pool under the new conditions is estimated at El. 1047 instead of El. 1057, as in the army engineers' design.

Another significant change in the design is the elimination of the navigation facilities and the placing of the spillway near the center of the dam, where its discharge will fall directly into the river channel. The power house has been moved to the east side of the channel to make way for the spillway. In this position more excavation is required for the tailrace, but this added excavation is offset by the elimination of the excavation required for the long spillway channel of the original design. Also, the power house is much smaller, two 50,000-kw. units having been substituted for three 55,000-kw. units in the army engineers' design.

The elimination of the 220-ft. barge lift has resulted in a major economy in the design. That lift was included in the army engineers' design because their study had as one of the objectives the determination of the cost of extending navigable channels as far as possible up the main river and its tributaries, apparently with little regard to the economic need for this navigable channel. The chance that a navigable channel above Norris Dam will ever be required is so remote that the Tennessee Valley Authority has eliminated navigation from consideration in its plans for the development of the Clinch River.

Elimination of navigation as a consideration in the design of the dam also made possible some advantageous changes in the program for the use of the normal flow of the river and the storage in the reservoir. With the necessity of maintaining a flow adequate for navigation in the Clinch River below Cove Creek removed from consideration, the discharge from the reservoir can be better regulated to meet the power needs of the lower river. This more careful control of the reservoir level has resulted in the substitution of drum gates for the sluice gates originally called for on the spillway crest and the addition of sluices through the body of the dam to permit accurate control of the discharge at all times.

Rainfall and runoff

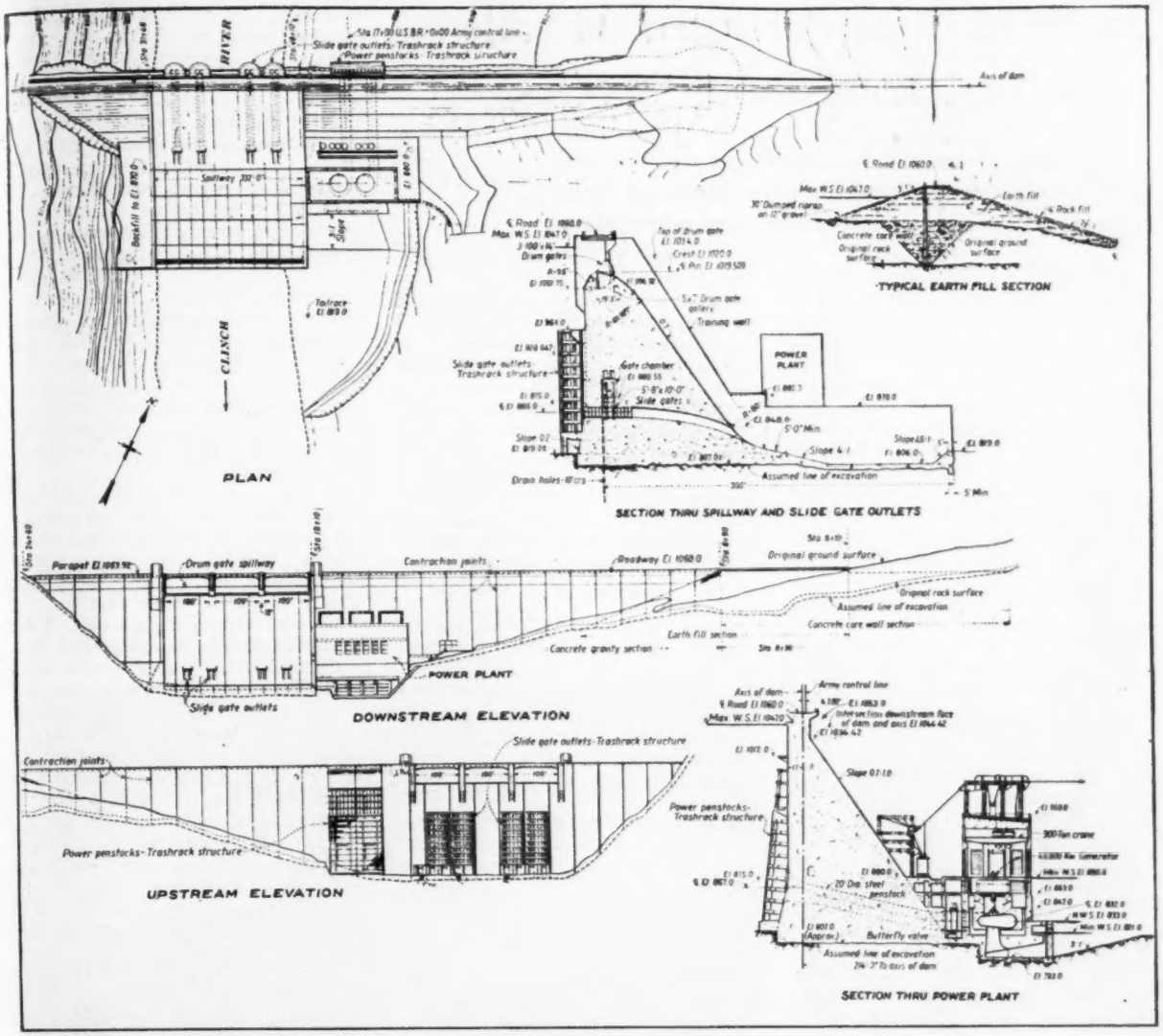
The Clinch River at Cove Creek has a daily discharge ranging from a low of 330 sec.-ft. (1919) to a high of 110,000 sec.-ft. (1886). It has a drainage area of 2,950 sq.mi., an annual runoff ranging from 1,700,000 acre-ft. to 4,830,000 acre-ft., and an average annual runoff of 3,300,000 acre-ft. The reservoir will have 500,000 acre-ft. dead-storage capacity, 1,500,000 acre-ft. for power production, 1,200,000 acre-ft. for ordinary flood control, and 400,000 acre-ft. for extraordinary flood control. The total storage capacity to El. 1052 is 3,600,000 acre-ft. The spillway capacity with all gates down and the reservoir at El. 1052 is 205,000 sec.-ft. The head on the power plant will range between 120 and 207 ft.

A comprehensive study of silting in the Tennessee River Valley was made in 1932 by Major R. R. Neyland, then district engineer at Chattanooga. From these data compiled by Major Neyland it is estimated that erosion conditions on the Clinch River drainage area are probably a little worse than those on the upper Tennessee River as a whole because of the greater proportion of cleared land. Assuming a silt flow of 0.03 per cent, double that now estimated for the Tennessee River at Knoxville, the annual silt load at Norris Dam would amount to 1,020 acre-ft. annually. With 500,000 acre-ft. of dead storage in the reservoir, it will take at least 500 years to use up the available storage.

Geological considerations

Geological conditions in the Clinch River Valley had an important bearing on the design of the dam. The rock underlying the valley generally is limestone known to have numerous caverns. At the dam site the rock in the abutments and in the river bottom is Knoxville dolomite in deep beds with clay and shale seams. Borings taken by the army engineers at the dam site indicated that the material was adequate to support the dam and that no large caverns existed. Further explorations by the TVA engineers, including the sinking of a deep shaft and the driving of a drift out under the river, have confirmed this conclusion.

The rock occurs in heavy bedded strata lying nearly flat or dipping gently downstream. The whole formation has been thoroughly reorganized since its original deposition, so that the rock is now compact and very hard. Above groundwater, the formation exhibits the usual surface irregularities resulting from weathering and percolating rain water over the very long time that the rock has been exposed to erosion. Below groundwater, the borings and other explorations indicate the rock is sound



THE NEW DESIGN of Norris Dam is notable chiefly for the elimination of the barge lift called for in the original design and the transfer of the spillway from the east end to the deep section in the river channel.

and, so far as is known, it is virtually free from important solution effects.

Exploration of the known caverns in the reservoir area indicates that none of them is likely to cause trouble through loss of water. Therefore, no effort is to be made to block them off. As the reservoir will fill slowly, a close check will be kept on surface conditions for indications of losses through underground channels.

An elaborate system of grouting the seams in the rock under the dam has been developed, by which it is purposed to check all underflow that might otherwise develop channels through solution of the rock.

An important change made recently in the design of the dam is elimination of a cutoff wall at the upstream toe. This was done to keep the bed of dolomite upon which the dam is to be built from being broken up or disturbed by the blasting required to make a trench for a cutoff wall. The TVA engineers believe that the possible advantages of such a wall will be more than offset by maintaining the underlying rock in an unbroken condition. Similarly, every effort has been made to reduce the amount of trenching into the bedrock required for the power house and other elements of the structure.

The principal details of the revised design are illustrated above. Important elements are the 100-ft. drum gates on the crest of the spillway, gates that are very similar to those to be used on the spillways at Boulder Dam. This is a natural development, as both dams were designed in the Denver office of the Bureau of Reclamation. Drum gates permit of more flexible control of the discharge over the spillways than is possible with the stoney gates of the original design. Further control of the flow in the river is provided in the slide-gate outlets through the dam spillway.

The semicircular trash racks at the upper ends of these outlet conduits are of characteristic Bureau of Reclamation design.

A novel detail of the design is the arrangement of the bulkhead gate for closing off either of the power-house penstocks. It is to hang against the back face of the dam above the trash-rack structure, suspended on a cantilever arm of a small 60-ton crane traveling longitudinally above the two openings in a recess below the roadway but above high-water level.

Engineering personnel

The dam is being built by the Tennessee Valley Authority under the direction of Arthur E. Morgan, chairman and chief engineer. Carl A. Bock is assistant chief engineer, and B. M. Jones construction engineer. John L. Savage, designing engineer, U. S. Bureau of Reclamation, has had charge of the design work.

Study of Weather Records Fails to Reveal Long-Range Cycles

Comparisons of records at scattered stations for the cycles of 11, 23 and 35 years indicate long-range forecasts would have been wrong about one-half the time

ATTEMPTS to fit weather records into cyclic form to be used as a basis for predicting future climatic repetitions have been numerous and varied, but as yet there is no substantial evidence that they have been successful. The economic advantages resulting from the ability of predicting future annual or seasonal precipitation and temperatures, combined with the fascination of seeking a solution to a natural secret, has provided incentive for many investigators. However, the facts that have been developed, in the light of impartial investigation, show conclusively that not one weather cycle, aside from the annual, has any practical value whatever as a means of long-range weather forecasting in the United States. These conclusions were reviewed in a paper presented by J. B. Kincer, chief of the division of climate and crop weather, U. S. Department of Agriculture, at a recent meeting of the American Meteorological Society. The outstanding conclusions of the paper are abstracted in the following.

Realizing the importance of the question and the advantages that would result from the development of long-range forecasting, the United States Weather Bureau gave serious consideration to the problem many years ago. In this, as in other similar cases, the problem was approached with an open mind but with a firm determination that something decisive, and not merely imaginary or fancied, would have to be developed before official recognition could be given to claims that actual weather cycles exist, in the sense that they could be made of practical value for forecasting purposes.

At one time a competent Weather Bureau investigator was assigned exclusively to this problem, and several years were spent in the study of the records. The results were disappointing so far as the question of weather forecasting is concerned. However, the matter is still being considered, and all claims made by persons not associated with the bureau are carefully investigated.

One difficulty with the correlation of various investigators is the multiplicity of cycles claimed to exist. Sir Napier Shaw, former head of the British Meteorological Service, listed 138 so-called weather cycles claimed up to 1928. These range from very short periods up to 260-year cycles, and are usually claimed to be associated with such phenomena as sun spots, tree rings, earthquakes, planetary positions and solar prominences. Most of these alleged cycles have attracted little or no attention, but a few have attained wide publicity, possibly because they are claimed to be associated with natural phenomena, such as the sun-spot period of 11 years or the double period of 23 years. These cycles are supposed to conform to the irregularly recurrent sun-spot activity. In addition, there is the well-known 35-year cycle commonly referred to as the Brückner period.

Methods of study

In the study of the problem, various methods have been used by investigators, ranging from a simple tabulation of data to complicated mathematical equations and even specially constructed machines. From the point of view of practical weather forecasting, it appears obvious that any weather cycle so obscure and indefinite as to be revealed only through the use of a refined equation, or highly organized mechanical device, is of no value. Such cycles may have academic importance but could hardly be used successfully in practical weather forecasting. If a cycle is definite enough for such use, its presence would be immediately disclosed by comparatively simple analytical methods.

For the successful forecasting of future weather from natural weather cycles, there should be nothing complicated in the process. For example, the precipitation for the coming year should require only the looking up of the "key" season for the past to make the necessary forecast. Further, this forecast should be definite as to time and place, and cannot be considered successful merely because a month, season, year or some adjacent geographic area happens, by chance, to conform to the prediction. If such a simple comparison is the basis for the success of climatic predictions, from the practical point of view, it is a simple matter to ascertain the presence or absence of usable cycles through a simple tabulation of data in parallel vertical columns with the proper time interval between.

Correlating the records

Take, for example, the 23-year cycle, which is usually referred to as the double sun-spot period: A 60-year record from a dozen well-distributed stations throughout the country (Portland, Ore., San Francisco, Calif., Denver, Colo., Bismarck, N. D., St. Paul, Minn., Omaha, Neb., St. Louis, Mo., New Orleans, La., Knoxville, Tenn., Pittsburgh, Pa., New York, N. Y., and Boston, Mass.) was computed to show the seasonal and annual departures of the temperature and precipitation from the normal. By using the 60-year records and considering both precipitation and temperature by seasons and annually, each station provides 370 comparisons of conditions at 23-year intervals, or a total, for the twelve stations, of more than 4,000 comparisons. These comparisons were based on seasonal and annual departures from normal, and when exactly normal conditions obtained, either in the base datum or the 23-year subsequent value, that particular case was omitted. Considering these omissions, there remained 4,274 couples, or sets of data, for comparison.

In other words, the departures from normal temperatures and precipitation were computed for each season and for the year, making a total of ten sets of data for each station, with the proper signs of departures from normal (plus or minus) indicated in each case. Then the rainfall, say, for the summer of 1874 (departure from normal), was compared with that of 23 years later, or the summer of 1897, 1875 with 1898, and so on through the record. In each case, if the signs of departures from normal were in agreement, either both plus or both minus, it was counted a "hit," or if unlike a "miss."

Of the 4,274 comparisons, there were 2,093 cases in which the signs were alike and which can be considered as substantiating the cyclic occurrence; and 2,179 comparisons were unlike, indicating disagreement with the cycle. In other words, based on the assumption that conditions would repeat themselves every 23 years, the correct sign of the departure from normal would have been forecast less than half the times. The twelve stations were in close agreement, one with another, on this comparison. No further comment appears to be necessary on this particular point.

In the case of the 35-year interval, the so-called Brückner period, two long-record stations, St. Paul, Minn., and Washington, D. C., offer 613 pairs of data, and in these cases there were 302 instances in which the sign indicated the departure from normal corresponding to the cycle, and 311 times in which the comparison indicated disagreement with the 35-year cycle. Also, for the 11-year period similar comparisons indicated 217 cases when the departure from normal, according to predictions, would have been correct, and 245 times in which it would have been in error.

Apparently there is but very little difference in the comparison of the 11-year, 23-year and 35-year cycles. When mass data are used, it appears to be a characteristic of all tests that in most cases a greater number of misses in

prediction would have been made than hits. The study of these observations also included methods of the progressive means and other more exact mathematical determinations. The general result showed that these methods indicated no better agreement, pointing toward the recurrence of the 11-, 23- and 35-year weather cycles, than did the individual comparisons.

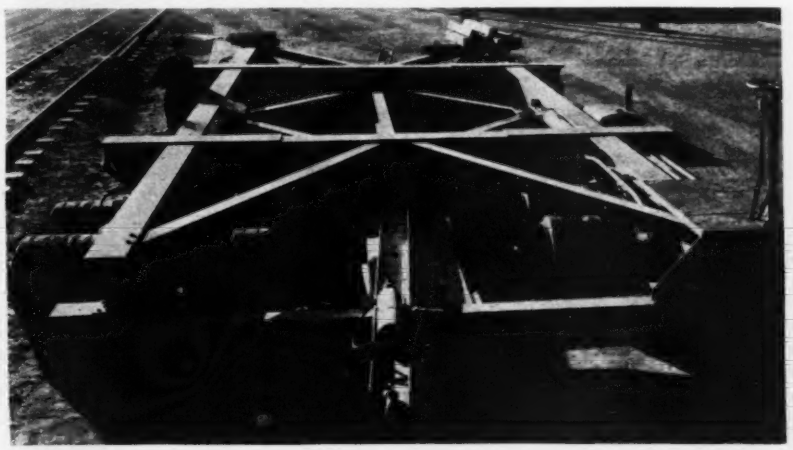
Trailer for Moving 185-Ton Units of Boulder Dam Penstock Pipe

THE FABRICATING PLANT where pipe for the penstocks and outlet systems of the Boulder Dam project is being made was built in an isolated spot on the desert for the sole reason that placing it in a more convenient location would have increased the transportation problem. Even in this isolated location the pipe sections have to be delivered over 1½ miles of road partly on 6.5 per cent grades. With pipe diameters ranging up to 30 ft. and with single pieces weighing 185 tons, the contractor faced a delivery problem for which there was no precedent.

A specially designed, rubber-tired trailer built to meet these conditions was not provided with motive power because it was more practical to haul it by tractors already on the job; but it was equipped with two power plants incorporated in the chassis, one to operate a compressor serving the air brakes and the other to operate a pump serving the oil-pressure system by which steering is accomplished. Because of advances that have been made in braking and steering systems using air and oil pressure, respectively, it was considered advisable to have two separate plants rather than to attempt to perform both of these functions by a single power unit. The trailer was built to specifications in Wisconsin, the parts shipped to Boulder City and there assembled and tested with a 194-ton load of reinforcing steel. The tests were met satisfactorily, and the trailer is ready to deliver penstock sections as soon as penstock erection begins.

In its essential parts the trailer consists of a chassis or framework of standard structural-steel shapes, the two longitudinal members being 33-in., 152-lb. H-beams. Pinned to the central part of the framework and projecting thence to either end of the trailer are two 10-in. steel channels that serve as drawbars.

CHASSIS OF GIANT TRAILER, showing operator's platform at right and general arrangement of the sixteen wheels.

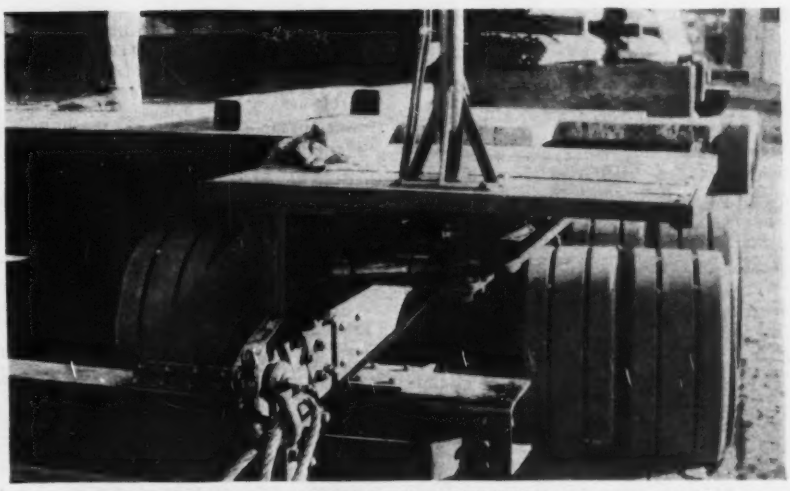


The over-all dimensions of the trailer are 38x22 ft., the wheels are 16 in number, 28 in. in diameter, and each has two solid rubber tires 14 in. in width. The wheel group at each corner of the trailer is carried on two axles, two complete wheel units being mounted on either end of each axle. These axles are each supported on a bearing ring so designed that the pressure on the ring under full load will not exceed 250 lb. per sq.in.

There is one drum for the application of internal expanding brakes for each dual-tired wheel—a total of sixteen brakes for the trailer. The shoes in each brake are in pairs, each contact surface measuring 3½x21 in. The brake shoes are actuated by air pressure from a small reservoir in which pressure is maintained by a gasoline-engine-driven pump with controls automatically regulated by pressure in the reservoir. With these brakes and with the small diameter wheels it is believed that no difficulty will be experienced in controlling the trailer with full load on the heavy grades. But a tractor will probably be used behind as well as in front of the trailer when moving the heaviest loads.

The steering mechanism consists of an interconnected lever system so arranged that all wheels are turned simultaneously by oil pressure. The oil pressure is maintained by a small pump driven by a gasoline engine, controlled automatically by pressure in the oil receiver. The arrangement is such that it is possible for the operator to cramp the wheels around to a 28-deg. angle. This enables the trailer to turn on an outer radius of 50 ft.

The design of the trailer was developed by the engineering staff of Six Companies, Inc., with the assistance of the C. R. John Co., Chicago, and contract for construction was carried out by the LaCrosse Boiler Co., of LaCrosse, Wis., who also developed details of design best suited to their standards.



WHEEL ASSEMBLY AND OPERATING MECHANISM that control braking through a four-way valve immediately under operator's platform.

Pittsburgh Area Inaugurates Its Flood-Control Program

Large masonry dam on the Tygart River will regulate flow of Monongahela River and lessen chances of future floods —Flood protection for Pittsburgh planned for 26 years

SHORTLY after the disastrous flood of 1907 in Pittsburgh, a commission was organized to ascertain means of relief from floods in the Monongahela, Allegheny and Ohio River Valleys. In January, 1934, just 26 years after the organization of the first commission, a $3,000,000 PWA allotment to the U. S. Army for a large masonry dam on the Tygart River, a tributary of the Monongahela above Grafton, W. Va., marked the actual start of a definite flood-control program for the Pittsburgh area. The proposed dam site is now being investigated by borings and test pits, preliminary to completion of design of the dam and start of actual construction.

The following, abstracted from a talk made recently before the Engineers Society of Western Pennsylvania by Major W. D. Styer, U. S. District Engineer at Pittsburgh, in charge of the project, outlines the past history and present plans for flood protection of the Monongahela River Valley.

Following the 1907 flood, the Flood Commission of Pittsburgh was organized on Feb. 20, 1908. The engineering committee of the commission consisted of E. K. Morse, Emil Swensson, W. G. Wilkins, George S. Davison, Paul Didier, Julian Kennedy, Morris Knowles and G. M. Lehman. A report was published in 1912 by the commission and received wide approbation, probably being the first report of its kind treating with source and control of floods on a large scale. The federal government had also been interested, not only in flood control but in navigation water supply as well. The river and harbor act of July 25, 1912, authorized an investigation of the necessity and practicability of establishing a system of impounding reservoirs on the headwaters of the Allegheny, Monongahela and Ohio rivers and their tributaries. The report upon the investigation was contained in House Document No. 1289, 62nd Congress, Third Session. The river and harbor act of March 4, 1915, also authorized an investigation of the Cheat River, Pa. and W. Va.; the Tygart River, W. Va.; West Fork River, W. Va., and numerous other tributaries of the Ohio River, with a view to devising plans for flood protection and determining the extent of federal cooperation, if any, based upon the value of such protection to navigation. This report was contained in House Document No. 1792, 64th Congress, Second Session.

Flood control in the tri-state district does not appear to have been actively considered again by federal agencies for some time. By an act of Congress approved May 31, 1924, investigation of the Allegheny and Monongahela rivers was authorized with a view to control of their floods. This investigation was made in cooperation with the state of Pennsylvania, and a report, as yet unpublished, was prepared by the U. S. Engineer Office of Pittsburgh on July 10, 1928. Again, by the river and harbor act of March 3, 1925, Congress authorized an investigation of those navigable streams of the United States and their tributaries whereon power development appeared to be feasible and practicable, with a view to formulation of general plans for the purposes of navigation and the prosecution of such improvement in combination with the most efficient development of potential water power, the control of floods and the needs of navigation. The streams designated in House Document No. 308, 69th Congress, First Session, included the Allegheny and Monongahela rivers and their tributaries. This investigation was made for the Pittsburgh area by the local U. S. Engineer Office, but as yet the report has not been submitted to Congress.

Another report was made by the U. S. Engineer Office on Aug. 21, 1933, in conformity with a Congressional resolution requesting a review of previous reports on the Monongahela River, with a view to determining if it were advisable to modify the existing project for the upper river. In this study the subject of navigation water supply was thoroughly investigated and included in the report. Although the general possibilities of the Tygart Valley for the location of flood-storage reservoirs were investigated by the Flood Commission of Pittsburgh, they were considered to require more extensive investigation before inclusion in its comprehensive plan. Such an investigation was made by the Corps of Engineers, with the result that the Tygart Reservoir site was included in a plan of improvement considered for the purpose of flood control and navigation as well.

The latest report on flood control for the Pittsburgh area was submitted by the U. S. Engineer Office, Pittsburgh, Aug. 24, 1933, as the result of a request made by the PWA to the Chief of Engineers for a report on an application received by it from the Flood Commission of Pittsburgh for a flood-control project for the protection of the Pittsburgh area. The Tygart River Reservoir was included in the project covered by this application. The report was studied by agencies of PWA, and several hearings were held on the subject, as a result of which the construction of the Tygart River Reservoir was authorized together with an allotment of $3,000,000 to commence its construction.

TABLE I—EFFECT OF TYGART RESERVOIR ON FREQUENCY OF FLOODS ON MONONGAHELA RIVER

	Frequency of Floods, Years					
Effect at Pittsburgh (mouth of Monongahela)						
Existing conditions	2	5	10	20	50	100
With Tygart Reservoir	2.2	6.1	16	39	110	225
Effect at South Brownsville, Pa. (Upper Monongahela)						
Existing conditions	2	5	10	20	50	100
With Tygart Reservoir	2.85	13.5	40	100	285	580

TABLE II—EFFECT OF TYGART RESERVOIR ON INTENSITY OF FLOODS ON MONONGAHELA RIVER

Effect at Pittsburgh (mouth of Monongahela)					
Gage height, ft., now		25.0	30.0	35.0	40.0
Gage height, ft., with Tygart Res.		24.6	29.6	34.1	38.6
Reduction in flood height, ft.		0.4	0.4	0.9	1.4
At South Brownsville, Pa. (Upper Monongahela)					
Gage height, ft., now	30.0	35.0	40.0	45.0	50.0
Gage height, ft., with Tygart Res.	28.2	33.2	37.3	41.1	45.9
Reduction in flood height, ft.	1.8	1.8	2.7	3.9	4.1

Flood control and navigation

The primary purpose of the Tygart River project is twofold: flood control and navigation water supply. Benefits will also extend to domestic and industrial water supplies along the Monongahela and upper Ohio rivers, sanitation along the same rivers, and in some measure to water power development.

The Tygart River basin, located in northern West Virginia, involves the rolling Allegheny plateaus to the west and the Cheat Mountains to the east. The principal cities and towns in the Tygart basin are Elkins, Belington, Philippi and Grafton, all situated on the Tygart River. The Tygart River rises in Pocahontas County, W. Va., and flows in a general northerly direction for 131 miles to its junction with the West Fork River at Fairmont, W. Va., where it forms the head of the Monongahela River. The Buckhannon and Middle Fork rivers are its principal tributaries. The maximum streamflow of record for the Tygart River, 57,600 sec.-ft., occurred July 25, 1912. The minimum streamflow of record, Oct. 21, 1930, amounted to only 1.1 sec.-ft. The mean flow amounts to 2,586

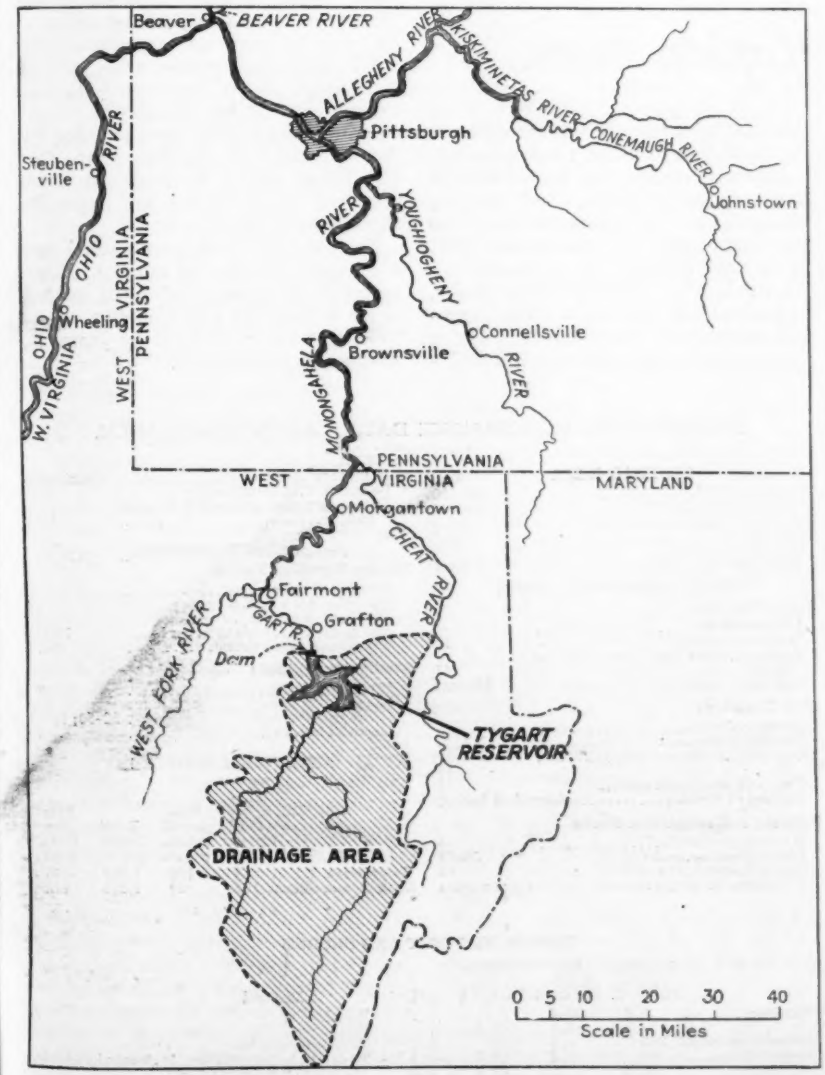
sec.-ft. These data are taken from the records of the gaging station at Fetterman, immediately below Grafton. The tributary drainage area above the gaging station is 1,340 sq.mi., and the records cover a period of more than 26 years.

Concrete dam 1,700 ft. long

The proposed dam will be located on the Tygart River at a point 2.25 miles upstream from Grafton, immediately above the Grafton municipal waterworks plant. The riverbed at the site is El. 960, and preliminary plans contemplate a maximum water surface of the reservoir at El. 1175. The height of the dam will be 215 ft. from riverbed to top of crest gates, and probably about 250 ft. from bottom of foundation to crest. The length of dam at El. 1175 will be about 1,700 ft. Preliminary plans contemplate a gravity structure of concrete, provided with a spillway controlled by tainter gates, regulating works, stilling or cushion pool for the dissipation of kinetic energy below the dam, gaging station, service bridge and roadway, dam appurtenances and operators' quarters.

The reservoir at El. 1175 will extend for a distance of 12 miles up the Tygart Valley to the vicinity of Moatsville, W. Va., and will also extend up Pleasant Creek Valley for 5.75 miles. At maximum contemplated water level the reservoir will have a capacity of 327,500 acre-ft., a surface area of 3,860 acres and a shore line of 68.6 miles. At El. 1090 the capacity will be 100,000 acre-ft., with a surface area of 1,780 acres and a shore line of 33.6 miles. The flowage damages involved do not appear to be excessive up to El. 1175. The Tygart Valley is not densely populated. Within the flooded area of the reservoir there are no towns or cities, but a few sparsely settled unincorporated villages will be affected by flooding of the reservoir. The Grafton-Belington branch of the B.&O. Railroad runs through the valley at a low level along the right bank of the river and will consequently require relocation. About a mile of primary highway and a small amount of secondary highway mileage will be affected.

LOCATION of proposed Tygart Reservoir, first of several projects planned for flood relief of Pittsburgh area.



The contemplated plan of operation of the Tygart project is as follows: Beginning at the first of each calendar year, the reservoir will be practically empty, from which time on it will be operated solely for flood-control purposes by retention individually of all floodflows when the Pittsburgh gage indicates the approach of a flood stage, and by the prompt release of impounded water from the reservoir when the Monongahela River at Pittsburgh is below the flood stage. Beginning April 1 and continuing until July 1 there would be allowed to accumulate in the reservoir a volume of 100,000 acre-ft. of water. From then on to Dec. 15 this volume would be drawn upon as required for maintenance of a regulated discharge of 340 sec.-ft. at Lock 8 on the Monongahela River, or, when not so required, gradually released for the benefit of navigation by increasing the navigable depth.

This plan of operation will permit the reservoir to attain its maximum utility for flood control and navigation water supply. Actual operations, of course, will vary with the amount and distribution of runoff.

The possibility of developing water power in connection with the Tygart project has been investigated. Although the full capacity of the reservoir will be relatively large, it is apparently impracticable to develop water power to any great advantage in addition to providing for flood control and navigation. The discharge that would be available for power development at the site would include the natural inflow between May 1 and Dec. 15 and the draft from storage. In a year of drought the inflow would be relatively small during the low-water season, and the combination of inflow and draft upon storage would be insufficient for the development of any appreciable amount of firm water power. The bulk of the power output would be secondary power available for only about 7½ months of

an average year and for only about 2 months in a drought year. Yet provision will be made in the design of the dam for the possible installation of equipment for hydro-electric development.

Benefits widespread

The Tygart project will eliminate floods from the lower Tygart valley and alleviate flood conditions in the entire reach of the Monongahela valley. Subsequent to the year 1854, when continuous records became available, Pittsburgh has experienced 86 high waters that were above the flood stage, or an average of 1.07 floods per year. Analysis of the floods of record throughout the Monongahela valley indicates that the Tygart River is a contributing factor.

The Monongahela River in low water presents the other extreme. During the unprecedented drought of 1930, which lasted from early July to the middle of December, navigation was suspended entirely on the upper Monongahela River above the mouth of the Cheat River, involving navigation pools 8 to 15 inclusive. On the upper river the locks were sealed to conserve the pools for water supply and sanitation.

The densely populated Monongahela valley depends to a great extent upon the river for water requirements. Any great deficiency of streamflow or pollution of the river results in serious consequences to all who utilize river water either for domestic or industrial purposes. The Monongahela River during the low-water seasons has a relatively high acid content, due to pollution from mine drainage and manufacturing wastes.

This pollution has a corrosive action on steam boilers and exposed iron and steel parts of boats, navigation structures and other equipment. It is expected that the storage in the Tygart reservoir will be alkaline at all times due to the character of the spring season inflow, and it should, when released, have a considerable neutralization effect upon the acidity of the Monongahela River. The Tygart project will also result in a dilution of the sewage content of the river and thereby improve the quality of the water for domestic water supply.

The estimated cost of the Tygart project is $12,000,000, of which $6,750,000 represents the estimated cost of labor. About 72,000 man-months of work will be provided, with 2,200 men as the probable maximum number to be employed at any one time.

Sewage-Plant Survey—VI

Data from Grand Rapids, Mich.

THE FOLLOWING ARTICLE is the sixth of a series presenting in brief form the salient design and performance characteristics of American sewage plants. Articles already published have presented data from the following cities: Decatur, Ill., March 29, 1934, p. 409; Cleveland, Ohio, April 12, 1934, p. 480; Schenectady, N. Y., April 26, 1934, p. 527; Aurora, Ill., May 10, 1934, p. 596; and Lima, Ohio, June 21, 1934, p. 813.

PLAIN SEDIMENTATION alone reduced the B.O.D. of the sewage at Grand Rapids, Mich., from 196 to 132 p.p.m., as an average for the year ending March 31, 1934. Following sedimentation, the sewage is discharged into Grand River. Sludge is digested in separate tanks, dried on sand beds and processed to form fertilizer. The accompanying tabulation gives the principal design features of the plant and the average performance data for the year named.

The existing sewerage system of Grand Rapids is largely on the combined plan, and there are 24 overflow relief points throughout the system. However, the sewage plant also treats the sewage from East Grand Rapids, which is sewered on the separate plan. The treatment plant was designed by Pearse, Greeley and Hansen in 1927 to care for a population of 250,000, estimated for 1945. Sewer construction was completed in 1929, and the plant was put into operation in November, 1930.

As noted in the tabulation below, there are four coarse screens. These comprise two sets of two each in tandem in each inlet channel. Velocity through the grit chamber is maintained in the neighborhood of 1 ft. per sec. by proportional weirs at the outlets. Conduits leading to the settling tanks are provided with porous-plate air diffusers on the bottom to prevent sedimentation.

Digestion tanks are provided with fixed concrete covers and stirring mechanisms. Gas is collected from two gas domes near the center of each tank. It is used as fuel for a gas-engine-driven blower, fertilizer-plant power, and is also burned under a boiler to provide circulating hot water for heating the digestion tanks and all plant buildings. Sludge gas produced during the year amounted to 50.7 million cu.ft., or an average per-capita production of 0.785 cu.ft. Its analysis averaged 33.5 per cent CO_2 and 65.4 per cent CH_4. The average B.t.u. value was 703.3.

In order to provide storage space for digested sludge during the months that air drying cannot be practiced, there are two tanks having an aggregate capacity of 350,000 cu.ft.

Sewage analysis figures given below are based on composite samples. Flows reported were measured by a venturi meter behind the grit chamber. Data have been made available by James R. Rumsey, superintendent.

SEWAGE-PLANT PERFORMANCE DATA, GRAND RAPIDS, MICH.

GENERAL DATA

Population, 1934	180,300
Population served, 1933	176,000
Rated capacity of plant, m.g.d.	32.5
Sewage flow	
Average, m.g.d.	25.8
Maximum day, m.g.d.	39.7

SEWAGE-TREATMENT UNITS

Coarse Screens

Number of units	4
Width of opening, in.	1½
Angle of screen with horizontal, degrees	45
Method of cleaning	Manual

Grit Chambers

Number of units	5
Plan dimensions, each unit, ft.	2–10x60; 3–8x60
Operating depth, including grit space, ft.	5½
Depth allotted to grit space, ft.	1½
Method of cleaning	Clamshell bucket

Primary Sedimentation Tanks

Number of units	4
Plan dimensions, each unit, ft.	80x80
Operating depth, at side, ft.	10
Provisions for sludge removal	Revolving scrapers
Frequency of operation	Continuous
Sewage flow, each unit, m.g.d.	6.45
Detention period at actual flow, each unit, hr.	1.84

SLUDGE DISPOSAL

Sludge Digestion Tanks

Number of units	4
Diameter, each unit, ft.	70
Depth, each unit, ft.	25
Sludge capacity, each unit, cu. ft.	78,125
Temperature maintained, deg. F.	87.5

Sludge-Drying Beds

Number of units	42
Length, each unit, ft.	100
Width, each unit, ft.	32–50; 12–25
Depth of bed, in.	18

ANALYTICAL RESULTS

	Settleable Solids, (2 hr.), c.c. per liter	Suspended Solids, p.p.m.	Total Solids, p.p.m.	Five-Day B.O.D. p.p.m.
Raw sewage	5.4	180	1,094	196
Settling-tank effluent	1.3	89	1,015	132

SCREENINGS GRIT AND SLUDGE

	Volume, Cu. Ft. Per M.G.	Dry Solids, Per Cent	Volatile Solids, Per Cent	pH	Disposal
Screenings	0.7	38.4	....	...	Burial.
Grit	4.9	50.6	41.5	...	Fill.
Settling-tank sludge	400	4.5	68	6.7	To digestion tanks.
Digested sludge	90	8.2	49.7	7.9	To drying beds in summer, to storage in winter.
Dried sludge	62.6	....	40.8	8.0	Made into fertilizer and sold.

Specifications and Tests Reviewed by A.S.T.M.—II

Important developments recorded in cement and concrete, brick, bituminous materials, lime and soils, at annual meeting in Atlantic City

THE FOLLOWING ACCOUNT completes the report of the annual meeting of the American Society for Testing Materials, the first half having been published in the July 5 issue, pp. 18 and 19. —EDITOR.

CEMENT was in the center of the spotlight at the annual meeting of the American Society for Testing Materials in Atlantic City, June 25-29, as steel and concrete have been at various times in previous years. In tune with the tendency throughout construction to look toward new and modified cements for specific purposes, the A.S.T.M. committee on cement, through its various working subcommittees, has given more serious thought to standards for cement than ever before in its history. Tangible results are expressed in a proposed specification for a modified portland of sulphate-resisting type. This was put in final shape for balloting, and a proposed specification for a low-heat-of-hardening cement was, in effect, rejected, being retained by the subcommittee, on its own motion, for further study. An additional achievement was a comprehensive report on plastic mortar tests and a proposed test method for 2-in. mortar cubes.

New cements

A tentative standard specification for a sulphate-resistant portland cement was adopted by Committee C-1 on Cement for submission to letter ballot; if approved, it will immediately go to Committee E-10 on Standards, with the recommendation that it be approved and issued. The specification is characterized by the use of a 2-in. plastic mortar cube specimen (as distinct from cement mortar tension briquets) by suggested strengths of 1,000 and 1,800 lb. per sq.in. at 7 and 28 days, respectively, by a limit of 8 per cent on tricalcium aluminate, and by a specific surface requirement of not less than 1,500 sq.cm. per gram, to be determined by the Wagner turbidimeter. Resistance to sulphate action is determined, as proposed by Merriman, by the distintegration of set pastes of cement in solutions of sodium sulphate and the accompanying cumulative amounts of sulphuric acid needed to maintain the solution at the same pH (hydrogen ion concentration).

Although much discussion and extensive investigation have occurred during the past few years on low-heat cement, because of the use of such a product on the Pine Canyon Dam and the Boulder Dam, the subcommittee charged with developing a specification asked that the subject be given further study because of the wide diversity of views now existing among users and manufacturers regarding the proposed specification. Also the present demand for such a cement exists entirely, or nearly so, in connection with large projects of the various branches of the federal government so that there is no widespread demand that needs to be met for such a specification.

Fineness—Much progress in the utilization of the Wagner turbidimeter for accurately determining cement particle size and distribution was reported. The instrument has been used to determine the fineness of all cements for Boulder Dam and is in the specifications for the Wheeler and Norris Dams. This turbidimeter, it will be recalled, is also in the standards for the new sulphate-resisting cement. A specification covering its use is in course of preparation by the subcommittee on fineness.

Plastic mortar tests

The report by the working committee on plastic mortar tests for portland cement included the results of co-operative tests of twelve cements by ten different laboratories, the results of which were sufficiently satisfactory to cause the committee to recommend a tentative test method covering the various details of manipulation and equipment required to make and test 2-in. plastic mortar cubes. Among the conclusions of the report on the tests made by ten laboratories were the following:

1. The compressive strength of plastic mortar cubes is a better measure of the compressive strength of concrete than is the tensile strength of standard briquets.

2. The uniformity of strengths of the individual cubes from the same batch of mortar is considerably better than that of the briquets.

3. The uniformity of strengths of the graded Ottawa sand cubes is somewhat better than that of the standard Ottawa sand cubes.

4. The uniformity of the tensile strengths between the ten laboratories was considerably better than that of the compressive cube strength.

5. The uniformtiy of the cube strength in the laboratories using the hydraulic-type compression-testing machine was considerably better than that in the laboratories using the screw-type machine.

6. Uniform rates of loading of 3,000 and 6,000 lb. per sq.in. per minute made practically no difference in strength results of plastic mortar cubes of standard Ottawa sand.

The constituents of cement

An unusually important and significant paper relating to a study of cement composition was presented by H. M. Gonnerman, Portland Cement Association, in a paper detailing 3½-year results on laboratory-prepared portland cement in more than 130 compositions. The effects of composition on strength, volume change, resistance to sulphate water, and to freezing and thawing of both mortars and concrete, comprised the subject matter of the paper, details of which will be presented in a future issue.

Lime

A specification for hydraulic lime which has been under study and revision for a perfof of eighteen years, according to J. R. Withrow, chairman of Committee C-7 on Lime, has been submitted to letter ballot. In spite of this significant development, Mr. Withrow pointed out that the committee has ten years of research ahead of it. Revisions of specifications covering quicklime and hydrated lime were adopted, the principal change being to remove detailed descriptions of test methods and to publish these collectively along with the present methods of chemical analysis.

Cement testing

A portable apparatus for the rapid determination of the surface area of portland cement by measuring the light passing through a sample suspended in castor oil was described in a paper by Alexander Klein, assistant research engineer, University of California. The apparatus is called a turbidimeter, and was described and illustrated in *ENR*, Nov. 2, 1933, p. 520. Briefly, the method consists of passing a beam of light through a sample of cement suspended in castor oil. The intensity of the light passing through this suspension is measured by its effect on a photronic cell, which is connected with a low-resistance microammeter. The method, according to the author, does not involve Stokes' Law, since the material is maintained in a suspended state during the test and permits rapid determination, a complete test requiring only 20 min. It is particularly adaptable to commercial plant control and routine testing where relative results are desired at short intervals.

A new type of device for measuring the heat of hydration of cement, called the "Vane Calorimeter," was described by Roy W. Carlson, research engineer, University of California. In principle, this device consists of measuring the

rate of heat transfer from the central metal cup holding the hydrating sample, along four metal vanes to the outer shell. The entire calorimeter is either surrounded by a kapok covering, or, better yet, buried in the ground where the temperature of the surrounding material is fairly constant. The calorimeter is calibrated by introducing a measured flow of electric heat in the interior cell and measuring the relative temperature of the inner cell and the outer covering together with the rate of transfer.

From this calibration it is possible to introduce a sample of hydrating cement into the inner cell and, by measuring the temperature of this sample and the outer surrounding material by electric thermometers, to determine the rate of heat transfer based on the calibration and, thus, the heat developed in the cement. The advantages of this apparatus are its low cost, as compared to the heat-of-solution method, the simple procedure and the possibility of using it for cements that cannot be dissolved in acid, required by the heat-of-solution method.

Concrete

The year's work of Committee E-9 on Concrete and Concrete Aggregates resulted in a new tentative specification for sodium silicate for use in curing concrete; also a tentative test method for determining coal and lignite in sand was recommended for publication. Five tentative specifications that have been in satisfactory use for three years were recommended for letter ballot to the society for adoption as standard. These include general specifications for curing portland cement concrete and specifications for curing, with bituminous coverings, calcium chloride admixture, surface application of calcium chloride and wet coverings.

In discussing "Effect of Duration of Moist Curing on the Principal Properties of Concrete," A. G. Timms, Portland Cement Association, pointed out that typical water-cement-ratio strength curves for moist-cured concrete were obtained regardless of the type of cement or test age. A significant feature of the strength tests was the small difference between the strength of moist-cured and air-cured specimens at ages greater than 28 days exhibited by the high-early-strength cement.

Increased expansion of mortars in moist air, but decreased shrinkage in dry air at eighteen months resulted from longer periods of moist curing. This was true for all water contents and for both types of cement. The difference in volume change between the normal portland and high-early-strength cement was not of great importance. In general, mortars of better quality were less absorptive.

Plastic Flow—A further progress report on the "Plastic Flow of Concrete Under Sustained Stress," as a result of the research work that has been under way for years at the University of California, was presented in a paper by Prof. R. E. Davis in collaboration with H. E. Davis and J. S. Hamilton, of the Engineering Materials Laboratory, University of California. Although previous reports have been presented of this extensive investigation, the present review was the first to indicate some opinions and conclusions.

Plastic flow, according to the authors, results from a combination of causes that cannot be separated, and the relative importance of each may differ in various cases. Three types of time yield may occur: (1) movement within the particles of the mass, as occurs in viscous materials, such as asphalt; (2) crystals in the mass may slip, corresponding to the observed creep in metals, and this is referred to as crystalline flow; (3) loss of water in the concrete mass, which is referred to as seepage. All of these factors may be involved in the observed plastic flow.

Water is contained in the concrete mass in all of the following forms: (1) chemically combined; (2) colloidal, and (3) free. The free water has no part in the volumetric change that takes place under sustained load.

The variation in the amount of colloidal water is the important feature in the plastic flow of concrete according to the authors. The flow of water into or out of the cement gel, through capillary action, results from the pressure gradient in the concrete. Thus, dry air at the surface of the concrete tends to suck the colloidal water from the clots of gel.

During this action the gel near the surface tends to dry out first, because there is less friction to impede capillary action. If the concrete is under water, the tendency is the reverse and the water tends to flow into the colloidal masses of gel. There is a tendency to establish equilibrium in the amount of colloidal water contained in the concrete. External loads on the concrete tend to expel water from the gel and, conversely, shrinkage takes place as this water is released.

The authors presented a large amount of data on the tests on plain concrete cylinders and reinforced columns subjected to sustained compressive stress, showing the effect of varying size of aggregate, mineral constituents of the aggregate, variation in curing conditions, and mixes.

A proposed method of making compression tests on portions of concrete beams from flexure tests was outlined in a paper by L. H. Koenitzer, applied mechanics department, Kansas State College. Based on a European development, the road materials laboratory of the engineering experiment station of Kansas State College, in cooperation with the Kansas Highway Commission, has made a study of a method for testing the compressive strength of concrete beams which differs from generally accepted procedure.

According to the method developed by the recent study, the 6x6x36-in. beam specimens are broken as simple beams loaded at the center. The pieces are sent to the testing laboratory, where they are capped with a mixture of one part cement and one part plaster of paris on the sides of the beam section, and not on the top and bottom as it was molded. This provides two smooth surfaces opposite each other, each surface being at least 7 in. long and extending the full width of the specimen. The specimen is placed in the machine with 6x6-in. machined cast-iron bearing plates and is tested as a modified cube, having the load applied over a 6x6-in. area and a depth of 6 in., with a short overhanging part of the specimen on each side of the plate. The length of projection beyond the plate is usually from 1 to 3 in., and an effort is made to have this projection symmetrical on each side. However, the photo-elastic analysis does not indicate that this balancing of overhang is essential. The specimens in almost every case break into a cone and two side fragments.

Bituminous materials

Committee D-8 on Bituminous Waterproofing Materials has completed extensive revisions in the four tentative specifications for asphalt roll-roofing, and has referred the new specifications to letter ballot of the committee.

Sewer Joints—Asphalt compounds for sewer pipe joints were discussed in a paper by J. S. Crandell, professor of highway engineering, University of Illinois. Because this type of material is known to possess certain advantages, particularly the ability to adjust itself to minor settlement in the line, a study was made to present definite information on its pressure-resisting qualities and ability to resist solvents and the penetration of tree roots. All of the samples submitted were adequate to withstand pressures usually encountered in sewers according to the tests. Small cracks or imperfections around the bell of the pipe often showed leakage near the joints which was not directly related to the jointing compound.

In the testing of wet joints, it was shown that pure asphalt, when heated sufficiently to pour a joint successfully, tended to foam when it came in contact with the water, which resulted in a weakening of the joint. A mineral filler of 30 to 50 per cent was successful in overcoming this foaming tendency, but the filler material is subject to settlement.

Proof of this assertion was demonstrated by analyzing samples taken from the top, middle and bottom of containers, both when they were received and at intervals during storage. Settlement, according to the author, may result in trouble in field operations. It tends to produce coking at the bot-

tom of heating kettles and ultimately results in burn-outs. Constant stirring in the kettles helps to overcome this tendency.

In an attempt to test the relative resistance of bituminous jointing compounds to gasoline and oils that may be present in sewer lines, joints were exposed to petroleum ether directly, and the time before failure was noted for the various compounds. This accelerated test to destruction showed asphalt joints failing in about four days. Of course, this test was only of use in determining the relative resistance of various samples, and did not indicate the length of time of this type of jointing material in actual practice where the presence of petroleum products is encountered only occasionally and with high dilution. Jointing compounds made out of coal-tar pitch were not affected by this test.

Stability of the compounds to resist disintegration, flow or creep was tested by filling joints and standing the pipes in racks in a room maintained at about 70 deg. F. It was found that those asphaltic compounds with high penetration would begin to yield and flow in a short time after the form was removed. However, if these asphalts were stabilized with filler material, this flow did not result. This test, again, was an accelerated test for comparison, as there was no earth to tend to hold the jointing compound in place.

Another interesting development was the use of creosote mixed with the joint compound, to keep tree roots out of sewers. The present tests did not give conclusive indications as to the effectiveness of this method.

Asphalt Tile—Inadequacy of existing means for testing asphalt tile by indentation led to the development of a new testing machine that was described as to characteristics and results by J. W. McBurney, research associate of the Asphalt and Mastic Tile Association at the Bureau of Standards. The new indentation tester provides a ¼-in. diameter steel sphere, which is lowered against the tile specimen under a 2-lb. weight, with the micrometer set at zero. Then an additional load of 28 lb. is placed on the tile by the simple rotation of a nut, and the resulting depth of indentation is observed on the micrometer at stated intervals. The method is simple, permits control of temperature by water immersion, and also permits observation on floors in place. For softer materials a ¼-in.-diameter sphere is used. The paper included an extended discussion of the results obtained, with particular reference to the time element of this type of testing.

Road Materials—An important development in the work of Committee D-4 on Road and Paving Materials was the report of a subcommittee proposing specifications and tests for asphaltic emulsions. Beginning about four years ago, when there was wide variation in the requirements for and testing of this road material, the committee has effectively worked toward the developing of a proposed tentative specification for various grades of emulsified asphalt, including coarse aggregate plant mixes, retread and coarse aggregate mixes, heavy premix winter grade, heavy premix summer grade, and quick-setting for penetration work. A proposed tentative method for testing emulsified asphalt was also reported by the subcommittee.

Subcommittee on Soils.—A new subcommittee of D-4 has been established to study soils for highway subgrades, with C. A. Hogentogler, U. S. Bureau of Public Roads, as chairman. Mr. Hogentogler presented a paper on subgrade testing methods. He approached this subject, which is new to the field of the A.S.T.M., by reviewing the extreme range of qualities encountered in any study of soils. The characteristics vary from conditions of complete dryness to saturation, consolidation to loose-fill material and a complete range of seasonal modification. He outlined the various types of soils and indicated some of the present testing methods that have been developed to assist in stabilizing materials for highway use. The paper was broad in scope and tended to introduce this general subject and indicate the present status of investigation without attempting to draw definite conclusions.

"A Laboratory Service Test for Pavement Materials," consisting of a 14-ft. diameter circular track in which paving materials are placed and subjected to the action of a roller or pneumatic-tired wheel, was described in a paper prepared by several of the laboratory staff of the National Crushed Stone Association and presented by A. T. Goldbeck, director. This testing device was built to help correlate the results of laboratory testing of highway materials with service behavior.

The reinforced-concrete circular track, 18 in. wide and 6 in. deep, has pipes embedded in the floor to permit temperature control of the materials under test. Into this trough are placed the graded road metals, combined with various binder materials. It is possible to construct two or more cross-sections for the same test. Discussion brought out the fact that the Bureau of Public Roads had a machine of somewhat the same type, and the highway departments at both Pennsylvania and Michigan used this general type of apparatus for the testing of highway materials.

Brick and masonry

Committee C-3 on Brick recommended that the tentative specifications for concrete building brick be adopted as standard. Committee C-10 on Hollow Masonry Units recommended the withdrawal of the three old standard specifications for hollow tile and one definition, because the improved tentative standards have now been approved and confusion could be avoided by withdrawing the old standards and allowing the tentative specifications to remain, and thus avoid overlap in this field.

Tests on reinforced-brick masonry columns were reviewed in a paper by M. O. Withey, professor of mechanics, University of Wisconsin. The test specimens were 12½x12½-in. brick columns, 6 ft. high, built up with varying percentages of longitudinal and lateral reinforcing. The tests showed that the effective strength of reinforced-brick column results from the sum of three components: strength of the plain masonry, strength of the longitudinal steel, and its yield point; and a more indefinite factor is caused by the lateral restraint of hoops placed in horizontal joints. The data indicated that with very strong brick and mortar, crushing strengths up to 5,000 lb. per sq.in. may be obtained on gross area, and 7,000 lb. on core area alone. Because steel is the most expensive material in this type of construction, economy warrants the use of strong mortars and high-strength brick. The author suggested that additional tests be made to ascertain more clearly the action of hooping and the efficiency of stronger mortars in combination with high-strength brick and steel.

A written discussion of this paper, by Professor Lyse, Lehigh University, reviewed a series of corresponding tests, described in some detail in *ENR*, March 16, 1933, p. 345, which involved somewhat similar testing procedure. The results were in general agreement with the tests described in the present paper.

Permeability of brickwork—The general subject of permeability of masonry construction and the effect of mortar condition of the brick as laid, tensile strength of the mortar, and its water-retaining capacity were reviewed in two papers: "Permeability Tests of 8-in. Brick Wallettes," by L. A. Palmer and D. A. Parsons, research associates for the committee on mortars and masonry research, maintained at the Bureau of Standards by interested manufacturers, and "Resultant Separation Cracking Between Various Mortars and Brick in Existing Brick Structures," by C. C. Connor, New Jersey Bell Telephone Co.

The first paper concluded that the watertightness of the test walls was dependent on properties of the materials, of which the most important was the water-retaining capacity of the mortars and the absorption rate of the brick. The tests indicated that the brick had greater effect an watertightness than the mortar characteristics. Wallettes made of porous bricks set dry showed better than the test specimens with mortar of low water-retaining capacity. The extent of bond with porous brick set dry increased as the water-retaining capacity of the mortars increased. It was considered especially important to wet very rapidly absorbing brick im-

mediately before laying, particularly if the mortar lacked workability and water-retaining capacity.

The second paper reviewed the study of brickwork on 38 existing buildings, where six different mortar mixes and 36 types of brick were used in the various combinations. Visible cracks in the brickwork constituted the important measure of this test. The author concluded that the factor of workmanship, within reasonable limits, does not influence the cracking of brickwork as much as the properties of the material used. The rate of absorption of brick is important, and a low or moderate absorption rate indicated best results. The effect of a high lime content in mortars was to reduce the amount of cracking. A combination of brick with low or moderate rate of absorption and a mortar containing a high percentage of lime produced the lowest percentage of cracking as observed in this study of field results.

Following the papers, the discussion of this subject became rather extended and indicated that there was considerable difference of opinion as to the source of the difficulties and conclusions indicated by the authors. It was apparently agreed that leakage through masonry comes through the bond joints between the brick and mortar, and the poorer this bond the greater the tendency for leakage. However, the factors in brick and mortar that produce water-tightness and the discrepancy between laboratory testing and actual field construction did not permit general agreement on conclusions. The discussion was not conclusive at to the difficulties or the methods of solution.

The de-airing process of brick manufacture was reviewed in a paper by W. C. Rueckel, Ohio State University, and R. B. Keplinger. Metropolitan Paving Brick Co. This method, which provides for evacuation of the air content of the clay during its preparation, results, according to the authors, in higher specific gravity of the product, higher modulus of rupture, lower absorption, higher crushing strength and more uniform quality.

A review made by questionnaire of the 55 paving-brick manufacturers showed that twelve were equipped to produce brick by this process. During 1933 eight paving-brick manufacturers actually produced de-aired brick with striking improvement in quality, particularly the higher percentage of sound brick obtained from the kiln and improvement in uniformity. Reports from these manufacturers also indicated that the weight of the units was increased as much as 5 per cent and the cost of production, considering all elements, ranged from the same to slightly higher.

Timber

A completely revised specification for timber piles was presented, which is said to meet all the objections advanced against former specifications. It is believed that the new specification is applicable to all classes of work where timber piles are used. It was pointed out that these specifications are, in general, based on a use classification rather than the customary technical and analytical requirements and are in substantial agreement with those of the A.R.E.A and the American Association of State Highway Officials. The timber committee also presented a proposed tentative specification for creosote and creosote coal-tar solution, calling attention to the fact that these were developed with the cooperation of the A.R.E.A. and the American Wood Preservers Association.

A review of the more important tests on the combustibility of wood, as they apply to fire-retardant specimens, was given in a paper presented by A. S. Williams of the Protexol Corp. Outstanding conclusions were: (1) the desirability of using two tests, rather than a single test, to secure proper data, and (2) elimination of the shavings test as unsatisfactory. Mr. Williams recommended using combinations of any two of the (1) crib, (2) timber, or (3) flame-tube tests as providing adequate test results. Wood specimens used to determine the best testing procedure were chestnut, commercially treated with ammonium salts.

Non-uniformity of material and difficulty in eliminating the personal element resulted in ruling out the shavings test, as well as the difficulty of securing quantitative results. The crib test, wherein small specimens ½ in. square by 6 in. long are piled in three layers in the form of a crib and exposed to a 1,200-deg. F. flame on the bottom for 1 min., provided good test results. Also the timber test, which consists of placing two ¾x1½x12-in. specimens of timber side by side and subjecting them to a 1,700-deg. F. flame for 1, 2 or 3 min., was considered suitable. In this test the observations included time of smoulder after the flame had been removed, loss of weight and percentage of unburned cross-section area remaining after the test.

The flame-tube test provided satisfactory comparative data except for difficulty in obtaining suitable specimens of the required length of 40 in. and the tendency to warp and interfere with uniformity of draft. The paper seemed to favor the crib test as most satisfactory, although confirmation by one of the other two tests was also recommended.

Test technqiue and materials

Several papers that concern general laboratory technique and testing apparatus were included in the program and may logically be grouped together here. In Russia, a tensometer utilizing a vibrating wire, sometimes called a musical tensometer, has been used extensively in civil engineering structures, a notable installation being in the Dnieprostroy Dam.

The instrument, described in a paper prepared by N. Davidenkoff, Physics-Mechanics Institute of Moscow, has a gage length of about 24 in., with the wire (12 in. long) mounted between. After the wire is under stress, an electromagnet causes it to vibrate. The sound is transmitted to a recording station where it is matched with wires vibrating under known stress. For use, when embedded in concrete, the wire and magnet are encased in a flexible copper tube.

Characteristics of the Huggenberger tensometer were reviewed by R. W. Vose (M.I.T.), and a specially designed interferometer calibrator was described.

The study has indicated, briefly, the following points of behavior: (1) for practical work the readings of the tensometer can be considered a straight-line relationship; (2) mounting pressure affects the multiplication of the instrument, and a pressure of 16 lb. was found suitable for ordinary work on metals; (3) the balance of the pointer must be maintained; (4) the position of the instrument (erect, on its side or inverted) may affect the reading; (5) proper seating of the instrument can be done by loading and unloading the specimen several times; and (6) friction lag in recording may be overcome by tapping the instrument slightly.

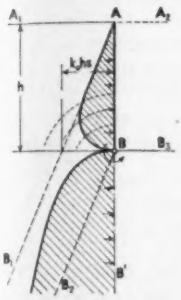
A specially designed elutriator used in the determination of particle sizes of hydraulic-fill dam materials was described as to design and operation in a paper by H. H. Hatch, engineer in charge, Cobble Mountain Reservoir, Springfield, Mass. Realization of the importance of the gradation of particle size in the construction of the Cobble Mountain earthfill dam (*ENR*, July 26, 1928, p. 124) resulted in an elaborate program of research in which the elutriator was augmented by microscopic projection for checking small-particle classification and by hydrometers for rapid control work.

Materials for structural models, with particular reference to dams, were discussed in a paper by A. V. Karpov (Aluminum Company of America). In planning a model of the Calderwood Dam several years ago, a thorough check of all available materials was made on the basis of the similarity conditions that a model has to satisfy. Mr. Karpov's paper reviewed all of these various materials and outlined the development of a special rubber litharge compound, stated to be the most satisfactory material known at present. Its principal disadvantage is a Poisson's ratio much higher than that of the concrete used in the prototype; there is also a danger that the manufacturing processes may give the rubber directional properties that are fatal to accurate model work.

Letters to the Editor

Side Pressure on Retaining Walls

Sir—The letter of Anders Bull in your issue of April 19, 1934, p. 514, seems to be based on a misunderstanding. My articles were devoted exclusively to the description and physical interpretation of the results of tests which were made under clearly specified laboratory conditions. I carefully avoided all practical conclusions because the application of experimental results requires careful and exhaustive analysis of all the circumstances which constitute the difference between test conditions and those to be dealt with in practice. For this reason I decided to reserve the practical conclusions for an independent series of papers not yet published. Hence when he attempted to draw a practical conclusion from the results of my tests, Mr. Bull did so on his own initiative.



Sand pressures against an imaginary wall *AB*, showing how arching of material reduces lateral pressure to zero along the base or at point *B*.

However, a few words may be said concerning the argument represented by Fig. 3 of Mr. Bull's letter. The pressure phenomena associated with the conditions shown in this figure aroused the writer's interest many years before he started his tests, and they impressed him for the first time with the infallible and universal efficacy of "arching."

To illustrate this statement, let us suppose that we have to deal with a natural deposit of sand with a horizontal surface A_1A_2. Before this deposit is touched, the horizontal pressure which acts per unit of area on a vertical section AB' at a depth h below the surface is equal to k_0hs wherein s represents the unit weight of the sand and k_0 the hydrostatic pressure ratio for the earth pressure at rest (k_0 = 0.4 to 0.45). The distribution of the horizontal pressure over this section is determined by the abscissas of a straight line AB_1. If we establish along AB' a very thin but absolutely rigid diaphragm extending downward to depth infinity and then excavate the space ABB_2 of depth h, the pressure that acts on the diaphragm from the left will be represented by the abscissas of AB_1 as it was before, while the pressure from the right will assume the values determined by the abscissas of BB_2. Hence, at every point of the diaphragm located below B the difference between the lateral pressures acting on both sides will be equal to k_0hs.

Finally, if we destroy that part of the rigid diaphragm which is located below B, by a chemical process for instance, the stress difference k_0hs must necessarily cease to exist, and we ask the question: what will be the consequence?

First of all, that part of the sand that is located to the left of BB' will expand slightly towards the right, thus mobilizing part of the passive resistance of the adjoining mass BB_2B'. However, at point B and immediately below it, either the lateral pressure must become equal to zero, or else heaving must occur, because in the vicinity of the free surface BB_2 the sand cannot resist any lateral pressure at all. That the lateral pressure actually does become equal to zero is shown by everyday experience in trenches in sand, whose floors never display any signs of heaving at all. Furthermore, in a mass of sand a pressure equal to zero cannot abruptly pass into a higher one. There must be a zone of transition. Hence, concerning the stress distribution along AB', we arrive by necessity at the result represented by the shaded area in the accompanying diagram. No such pressure distribution is mechanically conceivable unless arching keeps the pressure away from point B as indicated by the dotted lines, and there is no reason known to the writer why this condition should not prevail forever.

As a matter of fact, if arching were not a permanent institution of nature, many of our tunnels would gradually collapse, because absence of arching means Rankine pressure, and few tunnels are built to resist a pressure of such intensity. If one would attempt to exert the Rankine pressure upon the foot of a high vertical face immediately above B, by means of a board and screw-jacks for example, one would hardly succeed, because the material would yield under the stress and escape, as shown by the arrow. Hence the difference between the results obtained under the experimental conditions present in the author's test bin and those resulting under the conditions presented by Mr. Bull's Fig. 3 would be merely this: In the author's test the arching did not start until the wall had yielded through a certain distance. In a test carried out under the condition shown in Fig. 3 of Mr. Bull's letter, arching would start even during the backfilling process, because at B (owing to the absence of an overburden along BB_2) the lateral pressure *must* be equal to zero.

In practice, the diaphragm can be represented by sheeting. If we substitute for the sheeting a retaining wall, the distribution of the pressures over the vertical face will be somewhat different, yet still far from "hydrostatic."

In general, the writer wishes to emphasize the fact that no correct statement concerning the distribution of lateral earth pressure can be made without previously examining the mechanical effect of the deformations of the structure on which the pressure acts.

K. TERZAGHI,
Professor Technische Hochschule.
Vienna, Austria,
May 5, 1934.

Russian Research Methods Not Unique

Sir—The very interesting article in your June 14 issue on hydraulic research in Russia might give the impression that the analogy between electric and fluid flow has not been used outside that country. I know of two investigators who have used it in America: Mr. E. W. Lane, research engineer for the Reclamation Bureau at Denver, and Prof. F. T. Mavis of the University of Iowa.

Mr. Lane and his assistant, Mr. F. B. Campbell, have prepared an annotated bibliography on the subject, consisting of 21 items. From it I quote only two, but the second gives many other references.

(1) E. F. Relf: "An Electrical Method for Tracing Stream Lines in the Two-Dimensional Motion of a Perfect Fluid," *Phil. Mag.*, Vol. 48, 6th series, pp. 535-539 (1924).

(2) B. Hague: "Experimental Methods for Determining the Distribution of Electric and Magnetic Fields," *Electrician*, Vol. 102, pp. 185-187 and pp. 315-317 (1929).

In John R. Freeman's "Hydraulic Laboratory Practice," pp. 605-616, there is a discussion of the "flow net" and a graphical solution, but no specific mention of the electric analogy.

As a matter of fact, the magnetic field of force, the electrostatic field of force, the flow of electricity through a thin conductor, the flow of heat through a thin plate, the flow of viscous fluids between parallel plates a small distance apart, and the irrotational two-dimensional flow of a non-viscous liquid all satisfy the Laplacian differential equation, and any one of them may be used as an analogy of any one of the others. (There is also a soap-film analogy, as Hague points out.) But of all of them the one which I believe has proved most generally satisfactory is that described by Relf, which differs from that described in your article only by the use of an electrolyte in a shallow tray instead of a layer of tinfoil.

RALPH W. POWELL,
Assoc. Prof. of Mechanics,
Ohio State University.
Columbus, Ohio,
June 26, 1934.

ENGINEERING NEWS-RECORD

EDITOR—F. E. Schmitt. EDITORIAL STAFF—V. T. Boughton, W. G. Bowman, F. W. Herring, C. S. Hill, H. W. Richardson, J. I. Ballard, W. W. De Berard, N. A. Bowers.

Published by McGraw-Hill Publishing Company, Inc.
Editorial and Publishing Offices at 330 West 42d Street, New York

July 12, 1934

Volume 113, No. 2

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A Task Well Done

ENERGETIC promotional work by the American Road Builders Association has been a powerful factor in influencing the constructive and far-seeing legislation for federal aid of highway construction recently enacted by Congress. Concentration of association effort on the single and most immediate object of stabilizing federal aid has definitely proved its value. A law is now enacted which promises more for sound highway development than any accomplishment of the federal Congress since the basic federal-aid act of 1921. The task now is to consolidate the gains made in sound highway financing by carrying a similarly vigorous campaign into the state legislatures. In this labor the cooperation of all highway interests, which proved so effective at the national capital, is again demanded. The work begun by the road builders to mobilize these forces should have the support of all interests that prosper and increase by public-roads improvement.

Road Grants Justified

AN ACCOUNTING of accomplishment logically comes with the closing of the federal fiscal year and the almost simultaneous end of the first twelve months of road-building with Recovery Act grants. The figures effectually squelch any notion that this employment fund has been tardy along with other money for public works in getting into pay envelopes. Considering the $400,000,000 grant alone and including the 1½ per cent reserved for the cost of administration, nearly 95 per cent had been obligated on June 29 for 8,098 approved projects, all but 394 of which were under contract or under construction or had been completed. This is a good record, and it could have been better except that a new order of contracting and construction procedure, introduced under the Recovery Act, interfered with the established highway administration agencies. Some of these, disrupted by depression and political changes, had to rebuild fast-working organizations. With all handicaps, federal and state highway departments have put road money to work at the rate of $1,000,000 a calendar day; have for months led all public-works agencies in employment, and have now 250,000 men working on the roads and 375,000 serving them with materials and machinery from factory, mine and quarry—with the peak of employment activity yet a month away. By the end of the year the traveler will be served by some 25,000 miles more of improved road than gave him service a year ago. On every count the roadbuilder has proved by work done his right to the increased money grant and the continued federal aid that Congress awarded him a few weeks ago.

Creeping Paralysis

NOWHERE does efficient public service demand stability and continuity so much as in the municipal engineering department, and citizens know this truth so well that politicians generally respect the city engineer's office in their patronage raids. The more disturbing is the case of Seattle, where six city engineers have followed each other in ten short years, and where the latest incumbent, M. O. Sylliaasen, has just been ousted after the usual short tenure, not because of lack of competence or good performance but on the whim of a new politician-mayor. Time was when Seattle valued competence and stability in its city engineering office, as attested by the years of service of R. H. Thomson and A. H. Dimock. Since then, however, it has sunk to a level at which it allows politicians to make the office a sport of their spoils systems. In doing so Seattle has disgraced itself. Moreover, it has missed the opportunity to build strongly that part of its government upon which a city's physical growth most essentially depends. With the subordination of its engineering office to politics, the city may find that it has entered on a stage of creeping paralysis.

A Factor of Economy

CHECKING DECISIONS reached in the design office through full-scale field studies, prior to the start of actual construction, represents good engineering procedure, although it is seldom economically feasible. Acceptance of one design as more economical than another, based on drafting-board figures, frequently would profit by a check from field experience. Strength and safety may be checked by model study, but the handling of transportation, fabrication and erection problems on the site of the work presents the surest answer to the question of final economy of any design. Projects involving a single unit, such as a dam or bridge, are not susceptible to such a plan, but those consisting of a series of many similar units permit this logical intermediate step between design and construction. The proposed construction of scores of siphons on the Colorado River Aqueduct, as outlined on another page, is an example of how two types of design—in this case, the comparison between monolithic and precast concrete—may be tested under actual trial to learn the cost and advantage factors developed in the field. This test program is an example of careful engineering, and the result should effect valuable economies. Any procedure by which the knowledge of practical experience is introduced in the review of engineering designs between the drafting board and the start of full-scale field work constitutes the adding of a valuable economy factor.

Weather Cycles

CYCLES OF WEATHER have a popular appeal. We like to think that there is a definite progression in the weather changes which some day we will discover and be able to use. But so far none has been discovered. This is evident from a recent statement by J. B. Kincer summarizing a patient and exhaustive study of weather cycles made by the U. S. Weather Bureau and abstracted in this issue. Sun spots, solar prominences or planetary positions may have some bearing on weather conditions on the earth, but none of the evidence produced to date has shown what the relation is with sufficient clearness for us to predict what the weather will be next year or even next week. At any one of a number of selected points where weather records have been kept over a long period of years it can be

shown that such things as precipitation go through irregular cycles, as indicated by the chart of precipitation at St. Paul reproduced on p. 835 of our issue of June 28. Nevertheless, while the chart, for example, indicates that precipitation at St. Paul is at the bottom of a trough of subnormal rainfall, it does not contain sufficient evidence upon which to predict confidently that precipitation at St. Paul will begin to increase next year. It might continue to decrease. These are facts that engineers need constantly to keep in mind in the development of water resources. Our records of rainfall and runoff are far too meager to permit omission of provision against an unforeseen flood or a drought of longer duration than any on record.

Planning Without Maps

MUCH CONSIDERATION in these days is being given to national, regional and local planning; planning that covers land use, water conservation, development of natural resources, transportation, and even redistribution of population and housing. The present Administration is so impressed with the need for such planning that it has set aside $285,000 of PWA funds to aid state and regional planning agencies. This is a desirable development, but one element of such planning is lacking—adequate and up-to-date maps. In spite of the fact that our country became independent some 158 years ago, we have only small portions of our area adequately mapped. And while 45 per cent of the area of the nation is covered by topographic maps, many of these are so old as to be of little value; others of the old maps were made in a very sketchy manner because of scanty funds, and are wholly inadequate for modern planning.

From an engineering standpoint, therefore, it would seem to be logical to start a program of planning such as the Administration contemplates by taking up mapping on a comprehensive scale. There is no mystery in making a survey for maps. Any engineer can be trained quickly in the use of the theodolite, the precise level and the plane-table, and he also soon can learn how to transfer topographic features to a map from pictures of the country taken from airplanes. Further, with thousands of engineers today out of employment it would seem to be both logical and desirable to put the largest possible number of these engineers to work on something that is in line with their training. During the past winter there were 10,000 men engaged on emergency surveying projects under the Direction of the Coast and Geodetic Survey. About one-half of them were engineers. They were trained in high-grade surveying, and those same men could be absorbed in an expanded surveying and mapping program.

It would not be possible to meet at once the needs of the planners with topographic maps showing the contours, for it takes time to make a complete topographic map; but the sad thing is that there are many parts of the country for which there are no accurate maps of any sort.

It would be a distinct advantage, therefore, to have airplane mapping brought more into play. With the airplane, many square miles of area could be photographed in a day. These photographs, fitted into triangulations and traverses, will give a flat map that will be adequate for many purposes involved in the planning. Such maps could be made speedily and the work involved in adding contours could follow as rapidly as funds and engineers are available. Airplane photographs also could be used to advantage in bringing existing maps up-to-date.

Such a program of mapping appears to be a logical preliminary to a comprehensive program of planning, but logic alone gets few things done that require governmental action. Persuasive arguments and persistent presentation of subject also is needed. Civil engineers as a group are about the only ones who realize how inadequate are our maps. If, therefore, federal money is to be made available for mapping purposes it is up to the civil engineers in each section of the country to determine what maps should be available for comprehensive regional planning, which of the existing maps are serviceable, which need revision and the areas for which new maps are needed. It is safe to say that the PWA will not put up money for a blanket mapping program, but it is not too much to expect that it will make money available for specific undertakings, if the need for maps as an element of its planning program can be demonstrated. Specific information, not generalities, must be made available if the government is to be persuaded to go into mapping on a large scale.

Progress in Cement

CEMENT CONSUMERS and producers, as represented by the A.S.T.M. cement committee, took a step last week in approving a new cement specification that may foreshadow the end of three time-honored conventions—the tensile briquet test, the use of the 200-mesh sieve, and adherence to a single-standard portland cement. Probably the latter was overthrown several years ago by the specifications for a high-early-strength cement, but unlike that specification the proposed new specification covers a product whose chemistry actually is changed from standard portland. Labeled "sulphate-resisting," this new cement is low in tricalcium aluminate and high in iron. Basically its purpose is to produce more durable concrete. If it serves this purpose—it theoretically has all the other properties of the present portland—it has possibilities for superseding the standard product for general service as well as for requirements where corrosion is a factor.

The other two developments, which result from requirements of the new specifications, are perhaps more startling than a new cement. The briquet test has been so strongly intrenched for so long that it has marshaled sentiment as well as service to its defense. But it has represented one of the notable paradoxes of the engineering world, and a tension test for a compression product could not forever resist the logic of a compression test of plastic mortar cubes such as is proposed. On the other hand, the tension briquets have furnished an accurate, uniform and apparently satisfactory measure of cement quality for many years and will by no means be outmoded immediately. With respect to the 200-mesh sieve, the situation is quite different. Its failings have been common knowledge, and its demise will probably be sudden and permanent as a result of the new turbidimeter methods of determining particle size and distribution in cement.

None of these developments is entirely new; they have all been under study and discussion for years. But the new specification gives them a semblance of tangibility for the cement user by cloaking them with an official seal. And thus is progress made.

CURRENT NEWS

A.S.C.E Board Approves Code Draft Now Before NRA

IN UNUSUALLY active sessions held in Vancouver, B. C., July 9 and 10, the board of direction of the American Society of Civil Engineers dealt with many current questions and established some new policies. Public and professional matters including the engineers code and diversion of gasoline taxes for other than highway purposes were considered. After reviewing the origin and preparation of the code for the professional engineers division of the construction industry now before the NRA, the board unanimously voted endorsement. It also expressed approval of the new national policy against diversion of gas taxes to other than road service, as embodied in Hayden-Cartwright Road Act, and urged strengthening of the policy expressed therein by state action.

The board joined the American Water Works Association in its effort to promote water purity by deciding to require certificates of safety of local water supplies before selecting a place of meeting. Evidently taking note of recent political practices the board deprecated the requirement of political clearance for appointment to office of men whose work affects public safety. It proposed to take further action in respect to this matter. A committee report on prevailing salaries of engineers, amending the March report (*ENR*, March 15, p. 359), was approved as a tentative finding. A definition of minimum qualifications for an engineer recommended by the Engineers Council for Professional Development was approved. A committee is to consider proposals for a membership classification based on this minimum qualification. Cases of apparently unjust accusation of engineers led to the appointment of a committee to consider what may be done to aid defense against such charges. Another committee is to study the new professional problems that are leading to attempts to form new engineering organizations.

A regional section of the society in the Tennessee Valley was authorized with branches in Knoxville, Chattanooga, Florence and possibly Asheville. Except for the Texas group this is the first regional section with branch sections to be formed.

No meeting of the society is to be held next fall or spring and no decision was reached on the place of next summer's meeting. The board will meet in Chicago early in the fall.

International Engineering Body Established in Rome

Representatives of a number of prominent European engineering organizations met at Rome recently, at the invitation of the National Fascist Syndicate of Engineers, for the purpose of discussing the formation of an international engineering association, to be known as the European Federation of Engineering Associations.

Western Highway Officials Hold Meeting in Seattle

A governor's opposition to diversion of state highway funds was voiced by Clarence D. Martin, governor of Washington, in his address of welcome to the Western Association of State Highway Officials meeting in Seattle, July 5, 6 and 7. Governor Martin's remarks were directed toward an initiative measure now proposed in the state of Washington which would divert 25 per cent of the state motor vehicle fund to cities.

Prominent in the discussions were the terms and implications of the federal highway act which requires that after next July states be prepared to match federal financing. Concerted action on the part of western states may be necessary, some speakers pointed out, if desired allotments are to be secured in competition with more densely populated states of the East. T. S. O'Connell, chief engineer of the Arizona Highway Commission, showed how the position of advance planning has been strengthened by the Hayden-Cartwright act; O. S. Warden, president of the American Association of State Highway Officials, received warm praise for his help in securing the passage of the law.

Leslie M. Scott, chairman of the Oregon State Highway Commission, spoke of favorable experience in that state with several sections of pavement (bituminous surface on a crushed rock base) having a road structure with a total thickness of 24 in. and of plans now under consideration for experimental construction 36 in. thick. Oregon's practice is to use a gravel or crushed rock base even under concrete pavement.

New officers elected for the coming year were: President, Preston G. Peterson, member Utah State Road Commission; secretary-treasurer, R. H. Baldock, chief engineer Oregon Highway Department.

Five Old Bridges to Be Replaced by Allegheny County

Nearly $9,000,000 of the 24½ million dollar PWA allotment received two weeks ago from the PWA will be used by Allegheny County, Pa., for four new bridges. These bridges will replace five old structures varying in age from 30 to 50 years and thus will provide needed traffic improvement. All of the old bridges were originally built by private companies and operated as toll bridges for many years, although they were freed from tolls when purchased by the county. The new bridges will be toll structures, although provision is made for removing tolls after the construction cost is amortized. Data on the five old bridges as well as the new bridges to replace them follows:

The Youghiogheny River bridge at Third Ave., McKeesport, is the oldest of the five spans to be replaced, having been built in 1884 and purchased by the county in 1911, at the same time that another Youghiogheny River bridge at 5th Ave., built in 1895, was purchased. These two structures will be replaced by a new $689,000 span at Jerome St., McKeesport.

The Monongahela River bridge at Homestead was built in 1894 and purchased in 1915; it will be replaced by a $2,863,000 high-level bridge. The old bridge is some 1,300 ft. long.

The Highland Park bridge, newest of the five spans to be replaced, was built in 1902 and purchased by the county in 1912. This bridge, 1,725 ft. long, will be replaced by a $2,800,000 structure.

The Glenwood bridge over the Monongahela River was the first street car bridge in the county. It was built in 1897, has a length of 2,326 ft. and was purchased in 1924. It will be replaced by a modern bridge which is estimated to cost about $2,550,000.

Cement Code Authority Seeks Reinstatement of Marketing Section in Code

PROPOSING reinstatement in the cement code of Article XI on Method of Selling and Marketing Cement, suspended by General Johnson on Jan. 23, representatives of the Cement Code Authority appeared before NRA on July 11. At the same time criticism was voiced against numerous amendments proposed to the cement code by the Labor Advisory Board, Consumers Advisory Board and the NRA legal division, on the ground that if the alterations are made the code will cease to be voluntary on the part of the cement industry. The executive order of June 29, permitting the cutting of prices 15 per cent under posted prices, was also characterized as inviting "a return to primitive and unintelligent methods of selling."

Article XI is held by the Cement Code Authority to be the only means of bringing order out of chaos and at the same time to constitute a square deal for both buyer and seller. It outlines specific practices for selling cement to the various classes of customers and in most respects is similar to the article which was in the original code of Nov. 27, 1933.

The Cement Code Authority, in its statement at the hearing, contended that if the code fails, as it seems likely to if "the referee continually changes the rules," the labor provisions will fail with it. It was emphasized that the industry could not continue to pay code wages or to abide by curtailed working hours (36 hours per week) if it was to be stripped of the means of paying the increased costs. Unregulated competition and "the failure of NRA to do anything to assist the industry in the enforcement of trade-practice provisions" will effectively reduce the capacity of the industry to pay, the cement representatives concluded. At the time of going to press, the hearing was still in session.

Construction Code and Contractors' Budget Arrangements are Outlined

THE administrator of the National Recovery Administration has approved the budget for the Construction Code Authority, in the amount of $290,300.00 for a period of one year. In its application for approval of this budget, the Construction Code Authority indicated that Chapter I provides two methods of revenue: (1) registration of construction work or services of or in excess of $2,000 in value. (2) assessment of equitable and proportional share of its expenses upon members of the industry. It is conservatively estimated that the receipts will exceed the budget.

So far the Conctruction Code Authority is depending upon receipts of the first method to be collected from members of the industry in the assessment by each divisional code authority In case of the General Contractors' Chapter, wherein registration of construction work is also provided for, it is specfically stated that fees therefor up to a maximum of 1/10 of 1 per cent shall include payment of registration fees to the Construction Code Authority.

The Administrator's approval is conditioned upon submission within thirty days of an itemized statement of expenses of establishing the code; and upon submission at the end of every ninety days of an itemized statement of the receipts and expenditures of the code authority. The administrator also reserved the right to require audit of the accounts of the authority, and to order a revision of its budgets whenever facts developed indicate such action is necessary.

General Contractors' Budget

The Administrator also approved a budget calling for $2,750,200.00 to administer the Authority for the General Contractors' Division of the Construction Industry for one year. The major part of the expense is allocated to sub-divisional administrative agencies, and state and local administrative agencies which will administer the code in their respective localities. At least one administrative agency directly representing the divisional code authority is set up in each state to see that proper coordination and functioning of code requirements are maintained.

Each of the three sub-divisions to be provided for in the sub-chapters now pending before NRA (Building Contractors, Heavy Construction and Railroad Contractors and Highway Contractors) will maintain national sub-divisional offices in Washington with various administrative agencies in the field coordinated through the state administrative agencies of the divisional code authority. It is estimated that about 250 local administrative agencies will be required including the 196 cities in the United States with over 50,000 population.

In its application for approval of this budget, the divisional code authority stated that Chapter II of the code already conferred upon it the power to register construction work or services exceeding $2,000 in value, for a fee not to exceed 1/10 of 1 per cent. It is assumed that during the fiscal year there will be 100,000 construction projects to be registered, which will involve fees sufficient to cover the budget.

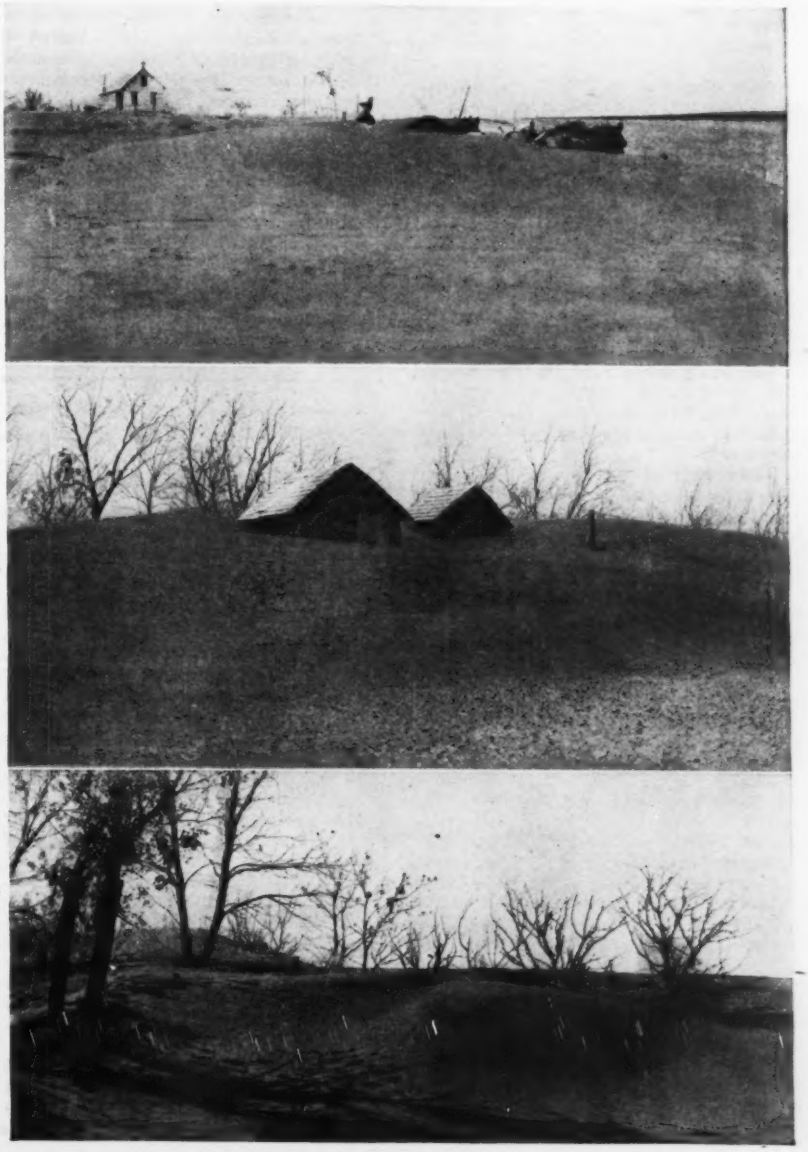
As in the case of the Construction Code Authority, the Administrator conditioned his approval of this budget upon submission within thirty days of an itemized statement of the expenses of establishing this supplementary code, upon submission of itemized statements of receipts and expenditures each ninety days, auditing of accounts when required, and revision of the budget if facts developed indicate such a necessity.

Parker Dam Construction Expected to Start This Summer

Specifications covering the construction of the Parker Dam unit of the Colorado River aqueduct of the Metropolitan Water District were received by officers of the district on June 25, and it is anticipated that work on the unit can be started during the coming summer months. Bids on construction of the dam, to be located about 150 miles downstream from Boulder Dam, will be received at the Los Angeles office of the Bureau of Reclamation until 10 a.m. July 26. The dam will be constructed by the bureau of reclamation under terms of a contract with the Metropolitan Water District.

DROUGHT BRINGS DESERT CONDITIONS INTO SOUTH DAKOTA

Lack of moisture, cultivated areas without the binding sod of natural grasses and high winds combined to give sections of western South Dakota a desert appearance during the first part of June. These conditions and some engineering aspects of the drought were reviewed in *ENR* June 28, p. 834, and July 5, p. 8.



Cities Continue to Request Reduced PWA Financing

MUNICIPALITIES continue to request changes from loan-and-grant type of PWA financing to straight 30 per cent grants. PWA headquarters has announced *22* recent changes, and the total to date is 236. These requests for changes in allotments have resulted in releasing $28,469,373, which was immediately re-allotted to projects on the waiting list.

Among some of the larger individual projects which will be financed on the basis of 70 per cent by t'e local government and 30 per cent by federal grant, as compared to the original request and allotment of 100 per cent of PWA money are: Winona, Minn., changes loan and grant of $298,000 for a school building to a grant of $84,500; Brigham City, Utah, changes a loan and grant of $175,000 for school construction to a grant of $46,200; Milford, Conn., changes a loan and grant of $935,000 for a sewerage system to a grant of $240,000; Lincoln, Nebr., changes a loan and grant of $216,000 for waterworks extension to a grant of $60,000; Gloversville, N. Y., changes a loan and grant of $167,000 for an earth dam to a grant of $49,500.

Allotments Rescinded

The PWA continues to rescind allotments to those municipalities failing to complete financing arrangements or seriously lagging in prosecution of projects. A release lists ten allotments totalling $769,900 as recently rescinded. The two largest projects in the list were a loan and grant of $250,000 to Lawrence County, Pa., for the construction of a viaduct and a loan and grant of $216,000 to Kirksville, Mo., for improvements to the sewer system. The latter rescinding resulted from failure to execute bond contracts and grant agreements.

There have also been several cases in which the government has increased previously awarded allotments but these projects are all small and the increases allotted to 14 projects only total about $70,000.

Allotment of $4,500,000 Made By PWA for Dam in Texas

An allotment of $4,500,000 has been made by the PWA to complete the Hamilton dam and reservoir on the Colorado river about 90 miles above Austin, Texas. The allotment is made as a loan to the Colorado River Co., San Antonio, Texas, which will act as a public agency in carrying on the project, pending creation of the proper public authority by the Texas legislature. The present company will operate under government control and the majority of the directors will be named by the PWA Administrator. This is one of the conditions under which the allotment was made.

The Colorado River Co., through its board of directors, consisting of three members of the Board of Water Engineers of Texas and five persons to be named by Administrator Ickes, will use the $4,500,000 allotment to complete a reinforced concrete dam, tunnel and penstock for irrigation, power generation, and municipal supply. The dam will store about 900,000 acre-feet and will have a maximum height of 137 ft.

Project history

The project was originally undertaken by the Central Texas Hydroelectric Co. (a former Insull company) and about $3,200,000 had been expended by the company in the purchase of land and for construction work. The project was about 40 per cent completed when construction was stopped for lack of funds. The plan contemplated the sale of power to a second company. About 80 per cent of the bonds issued to finance this project are now owned by the Mississippi Valley Investment Co. (another Insull corporation). Both the power company and the investment company are in receivership.

The newly organized Colorado River Co. has a contract with the receiver of the Mississippi Valley Investment Co., approved by the U. S. District Court, Chicago, whereby the receiver agrees to move the court in the Central Texas Hydroelectric receivership for an order of sale turning over to the Colorado River Co. the bonds held by the investment company, all on condition that the Colorado River Co. obtain a loan sufficient to complete the project.

The general design and construction features of the Hamilton dam project were described in *Engineering News-Record*, Jan. 12, 1933, p. 59.

New Housing Organization Being Formed in Washington

Washington Correspondence

James A. Moffett, the administrator of the new National Housing Act, estimates that the home modernization program will be under way in less than 30 days. He has also expressed confidence that a goal of $500 millions spent in home repair and modernization by Fall is not beyond reach.

Quoting lumber, steel and other industrial leaders as very enthusisatic over the Act, Mr. Moffett said he did not know to what extent they would reduce prices but confined himself to the safe generality that "it would be perfectly natural as volume increases that they would shade their prices." The cement industry has been asked to cut its open-price list by 15 per cent. The lumber industry is preparing to reduce mill price minima by 10 per cent. The full force of the administration's attempt to bring down building costs into line with the mass market may not be felt, however, until home building overtakes the repair and modernization campaign, which is slated for first consideration.

This past week has been devoted to organizing the new Housing Administration into several divisions—modernization, mortgage insurance, building and loan deposit insurance—with a director at the head of each. With a headquarters staff of approximately 250, the extent of the field forces will depend on how much the Housing Administration can utilize the widespread facilities and personnel of the Natonal Emergency Council, Reconstruction Finance Corporation and Home Owners Loan Corp.

The PWA has allocated $1,000,000 to the new housing administration for initial expenses.

Detroit to Apply For PWA Loan to Build Sewage Plant

OFFICIALS of the city of Detroit and Wayne County have conferred with PWA officials on the form of application to be prepared for financing a $23,000,000 sewage disposal system to serve Detroit, and other down river communities on the Detroit River drainage area, departing from the earlier suggestion to use a site on the Fort Wayne Military Reservation. Two plants are now proposed, one to be on West Jefferson Ave. and the other on a down river site. A force main from Grosse Ile to the mainland is proposed to handle the island's sewage.

Two possible methods for handling the project have been advanced. One proposal calls for completion of the project by the Federal Government at its own cost on the theory that pollution of boundary waters between Michigan and Ontario would be stopped in accordance with existing treaty obligations. The other course is to complete the disposal system as a county project, secured by bonds issued by Wayne County. The bonded indebtedness of the city of Detroit will not permit the issuance of the bonds, whereas Wayne County has sufficient bonding leeway. An extra charge to all water users in the district would amortize the bonds under the present plan for financing.

Other applications

Other PWA applications which are being revised for Detroit projects include one for $1,500,000 to extend the facilities of the public lighting department to enable it to carry a greater share of the load of the department of street railways. Revenue bonds would be issued as collateral.

The department of water supply has applied to Washington for a grant of $250,000 for the balance on a $750,000 project for miscellaneous repairs and improvements. The sum of $500,000 has been allocated to the project by the department.

A garbage incinerator project including four plants for the city of Detroit at a total estimated cost of $1,400,000 has also been proposed to PWA officials at Washington and the application is being revised.

U.S.G.S. and C.&G.S. Ask $5,500,000 From PWA

Allotments totalling $5,500,000 have been requested of the PWA by the Coast and Geodetic Survey and the Geological Survey to carry forward a combined program of control surveys and mapping. Legislation proposing a large appropriation for such a mapping program failed to be enacted in the last Congress because of President Roosevelt's objection to statutory allocation of the $500,000,000 fund appropriated for public works.

According to announcement, no consideration has yet been given by the PWA to this application for mapping as it is the announced policy of the PWA to distribute the new fund first to the non-federal projects awaiting allotments. The American Engineering Council is advocating the project of surveys and mapping as an ideal means of creating employment for engineers.

PWA Speeds Low-Cost Housing Projects By Court Action

CONDEMNATION proceedings have been requested by Administrator Ickes in the federal courts to acquire about 17 acres of slum property at the edge of the downtown section of Cleveland, Ohio, to expedite the low-cost housing project to be built on this area by the Public Works Emergency Housing Corporation. As soon as title is acquired to this land, work will start on the $2,870,000 project, rehabilitating a district characterized by crime and unhealthy living conditions, according to both public and private organizations in Cleveland. This undertaking is known as the Cedar-Central project and is the third to be started by the corporation in the PWA's $146,000,000 low-cost housing program. The other two projects are under way in Atlanta, Ga.

Atlanta Projects

The federal government is prepared to make its first payment for land to be used in the low-cost housing program for the University project in Atlanta, Ga. The payment will cover land taken over by the government in condemnation proceedings. Both the process of condemnation and the payment policy are expected to serve as a precedent for the program in other cities.

Title to the property was vested in the federal government under a "declaration of taking" and a jury is to be impanelled before the federal court to establish a fair value on the parcels of land. As soon as this formality is completed, payments to the former property owners will proceed under the orders of the court. The government has already deposited about $286,000 in escrow to pay for the property. The government is prepared to go into court with condemnation proceedings for the second Atlanta project.

The University project will provide a series of 2-story houses and 3-story multiple dwellings to accommodate 600 negro families at a cost of about $1,600,000. The second, or Techwood, project will consist chiefly of 3-story walkup apartment buildings with some 2-story row houses providing for 600 families at a cost of about $2,700,000. Both projects will include space for stores, playgrounds, and gardens.

Two Railroad Conventions Meet For First Time Since 1930

Two railway associations which have not held their customary annual meetings since 1930 because of business conditions will hold conventions in Chicago this fall. The Roadmasters' Association of America will hold its meeting in September and the American Railway Bridge and Building Association will meet Oct. 16 to 18. Several subjects which were assigned to various committees for report in 1930 will be presented, supplemented by subjects which have been assigned more recently. T. F. Donahoe, Pittsburgh, Pa., is secretary of the Roadmasters' Association, and C. A. Lichey, Chicago, Ill., is secretary of the Bridge and Building Association.

Washington Road Fund Diversion Proposed by Initiative

Diversion of 25 per cent of all highway funds in the state of Washington for use of cities is proposed in an initiative measure which has obtained the 50,000 signatures necessary and was filed last week. It will be before the voters this fall. The proposed bill would make all streets, roads and bridges in incorporated cities and towns a part of the state highway system and would put into the hands of city authorities one quarter of all money in the state motor vehicle fund for "construction, reconstruction, operation, improvement and maintenance" of the city's streets and bridges, or for the payment of principal or interest on bonds whose proceeds are used for the condemnation of property for, or the construction of, such streets and bridges. Distribution of the money would be in ratio which the number of vehicles in any city bears to the total number of motor vehicles in all incorporated cities.

As at present allotted, 38 per cent of Washington's motor vehicle fund goes to main state highways and 46 per cent to secondary highways. The initiative measure, by diverting money to cities out of the state highway allotment, would reduce the 38 per cent to 13 per cent. Thus when the state's gross annual revenue from license fees and gas taxes amounted to $14,540,000, 38 per cent, or the state highway share, was $5,525,000. If this is reduced to $1,890,000, as it would be if the initiative passes, there would be money for only part of the state maintenance work and none for new construction, rights-of-way, repairing flood damage or other emergency work. State highways also would lose federal aid to the extent that state money no longer would be available to match federal funds.

Planning Boards In Existence Now in All but Nine States

There are now 739 city planning boards in the United States, 717 of which are official agencies, according to a report of the National Planning Board. City planning boards have been set up in 43 states and the District of Columbia.

Comprehensive city plans have been prepared in 218 cities, the report states. Of this number 163 have been officially approved by the city planning boards and 105 of these have been adopted by city councils.

The only states now without planning boards are Mississippi, Massachusetts, Louisiana, North Carolina, West Virginia, Delaware, Pennsylvania, Rhode Island and Texas. In its report the National Planning Board said:

"Planning must appeal to the public as the sensible and economical method of determining the long time public works program. This can be accomplished, however, only by continuous educational efforts aimed at thoroughly acquainting each and every citizen with the purposes or objectives and advantages of planning well in advance of development."

Washington Monument Will Be Repaired at Cost of $100,000

Contracts for cleaning and repairing the Washington Monument, under an allotment of $100,000 by the PWA, were announced by the National Park Service, of the Interior Department. Contract for the erection of scaffolding was awarded to the Archer Iron Works, Chicago. Plans call for the erection of scaffolding from the base to the top of the 555-foot monument, from which workmen can perform the task of cleaning and repairing the structure.

Upper Basin States Meet and Agree on Continued Study of Colorado River Use

AGREEING that further study of the water supply, and utilization of the upper Colorado River system is necessary before allocation can be concluded, representatives of the four upper basin states —Colorado, Wyoming, Utah, and New Mexico—met and reviewed the progress on the proposed upper-basin pact in Denver June 29-30. It was generally agreed that a systematic plan for development probably would require from two to four more years of study but in the meanwhile the conference agreed that all projects in the four states now under way or approved for construction by the Bureau of Reclamation or the PWA should not be delayed. Further, no state will object to the projects to be constructed in other states unless these projects require a volume of water which too nearly approaches that which will be expected to be the final allotment for that state. The conference passed a resolution urging a federal appropriation of $1,000,000 to carry forward the comprehensive study of the river and its use which is now under way under the direction of the Bureau of Reclamation.

The conference recommended another meeting at an early date and expressed the sentiment that Arizona, which has not ratified the seven-state compact, be required to do so before allotments are finally determined for all states.

The Bureau of Reclamation was represented at the conference by Dr. Elwood Mead, commissioner, and Porter J. Preston, engineer in charge of Colorado River investigations. Mr. Preston reported that steady progress had been made on these investigations, provided for by an appropriation of $250,000. He indicated that a large amount of research is still necessary.

In outlining the general problem and the approach of the Bureau of Reclamation in working out a program of equitable utilization, Dr. Mead indicated that the bureau was not ready at this time to present any definite program. However, Dr. Mead indicated that "the fundamental principle to be followed, as among the four states, is that water must be applied where it can be practically and economically employed regardless of state line."

Dr. Mead indicated that the work of the bureau investigating irrigable sections of New Mexico and Wyoming was fairly well advanced, but that little had been done in Utah and Colorado, with the exception of the San Juan section.

PWA Non-Federal Awards Continue with 234 Announced

ANNOUNCING 234 more non-Federal allotments, the PWA brought the total of municipal projects financed during the past week up to 1,241, representing $189,771,253. Four previous releases announcing allotments for about 1,000 non-Federal projects were noted last week.

This quick action on the allotments for non-Federal projects following the new appropriation to carry forward the employment-creating public works program, made available by the last Congress, was possible because of the waiting list left when the original $3,300,000 fund was exhausted. Administrator Ickes ordered the engineers, attorneys, and financial experts of the administration to carry forward the study of applications left on the waiting list and to prepare them so that they could be financed at once if further funds were provided.

The estimated cost of the non-Federal public works projects to be built with the present allotments is $225,000,000. The difference between this figure and the allotment of $189,771,253 by the PWA results from the fact that 256 of these allotments provided only 30 per cent grants, as these applicants prefer to furnish the rest of the money from other sources.

Few large projects

Carrying out the program of spreading the present funds to as many municipalities as possible, the recent list of 234 allotments contains few large projects. The first section of a complete list indicating the municipalities, amount of allotments and type of work to be done for the 1,241 allotments announced during the past week by the PWA follows:

Waterworks

KEY TO SYMBOLS

*-grant only	
m-meters	**e**-canal
p-pump	**dm**-dam
t-tank or standpipe	**r**-reservoir
f-filtration	**tr**-treatment plant
d-distr. supt.	**b**-building
w-well	**i**-iron removal
s-supply	**pw**-power line
g-generator	**sf**-softening
ch-chlorinators	**bl**-boilers

Adrian, Mo., **w-p-t-d**	$49,000
Alva, Okla., **t**	39,000
Amherst, Tex., **w-p**	5,000
Arapaho, Okla., **p-d**	3,000
Bartlett, Tex., **d**	16,000
Bellwood, Ill., **t-d**	30,000
Bethany, Ill., **w-p-t-d**	48,000
Blackshear, Ga., **w-p**	2,100*
Blackville, S. C., **w-p-d**	45,000
Bowden, Ga., **w-p-d**	20,000
Britt, Ia., **t-d**	26,000
Brookside, Ala., **w-p-r-d**	24,000
Cairo, W. Va., **ch-p-d**	8,000
Camden, Tenn., **p-t-d**	46,000
Canal Winchester, Ohio, **i-p**	13,000
Columbiana, Ohio, **i**	14,000
Cornelia, Ga., **dm-r-f-p-t-d**	90,000
Crane, Tex., **s-t-d**	48,000
Crockett, Tex., **w-p-r-tr-d**	76,000
Davidson Co., N. C. (school, water supply and sewers)	80,000
Deer Creek, Okla., **w-p-t-d**	25,000
Defiance, Ohio, **t-d-b**	93,000
Delphos, Ohio, **w-p-g-ch**	43,000
Dexter, Mo., **d**	12,000
Durham, N. C., **t**	160,000
Elliott, Iowa, **w-p-s**	3,600
Elmhurst, Ill., **2r-p-d**	66,000
Elmira, N. Y., **d**	6,000*
Fairbury, Ill., **w-p-d**	55,000
Faison, N. Car., **w-p-t-d**	47,000
Falkville, Ala., **w-p-t-d**	29,000
Fayetteville, Tenn., **d**	11,000
Fletcher, Ohio, **w-p-t-d**	28,000
Florence, Ky., **d**	22,000
Forrest, Ill., **w-p-t-d**	32,000
Fort Dodge, Iowa, **d**	34,000
Fort Smith, Ark., **dm-r-f**	1,650,000
Fort Wayne, Ind., **dm**	53,000*
Frederick, S. D., **w-p-t-d**	19,000
Fredericksburg, Tex., **w-p-t-d**	228,000
Glenwood, Ark., **p-f-t-d**	53,000
Grand Rapids, Mich., **t-bl**	21,000*
Hamilton Co., Ohio, **t-d**	16,400*
Harcourt, Iowa, **w-p-t-d**	19,000
Haskell, Tex., **ch-t-d**	45,000
Hebron, Ohio, **w-p-t-d**	47,000
Highmore, S. Dak., **t**	2,100*
Hinsdale, N. H., **sr-tr-t-d**	147,000
Homewood, Ill., **t-f-p**	52,000
Jackson, Ala., **p-t-d-s**	29,000
Jet, Okla., **w-t-d**	20,000
Joliet, Ill., **dm-r-t-r-d-t**	1,790,000
Kerens, Tex., **dm-tr-p-m**	83,000
Lancaster, Mo., **w-p-r-t-d**	55,000
LaPorte, Ind., **p-t-r-d**	190,000
Lebanon Junction, Ky. (Waterworks and Sewage Disposal)	64,000
Leesburg, Ohio, **w-p-tr-d**	21,000
Lenoir, N. C., **d**	60,000
Lexington, Okla., **d-p**	15,000
Littlefield, Tex., **p-g-d**	48,000
Louisville, Ga., **p-r-cl-d**	7,000*
Manchester, Ky., **dm-p-f-r-d**	54,000
Marble Rock, Iowa, **t**	900*
Marion, Ind., **d**	221,000
Martelle, Iowa, **w-p-t-d**	15,000
McLeansboro, Ill., **d-p-t-d**	74,000
Midlothian, Ill., **s-p-d**	40,000
Midway, Ky., **s-p-f-t-d**	60,000
Millport, Ala., **s-r-ch-p-t-d**	43,000
Monett, Mo., **p-d**	32,000
Monroeville, Ohio, **tr-m**	32,000
Morenci, Mich., **w-p-t**	20,000
Morrisonville, Ill., **p-d**	31,000
Mound Valley, Kans., **d-p-f-t-d**	45,000
Moundville, Ala., **w-p** (also sewage disposal)	41,000
Nokomis, Ill., **tr-f-d**	45,000
Oakland, Iowa, **w-p-d**	16,000
Olean, N. Y., **d**	109,000
Onset Fire Dist., Wareham, Plymouth County, Mass., **d**	21,000
Osawatomie, Kans., **tr-gr**	85,000
Oskaloosa, Iowa, **s-tr-sf**	95,000
Paris, Ill., **p-f-d**	52,000
Perry, Mo., **dm-p-f-t-d**	56,000
Pinckneyville, Ill., **dm-d**	26,000
Quindaro Township, Kans., Wyandotte County, **p-t-b-d**	150,000
Rhode Island Emergency Public Works Corp.	
Exeter, R. I., **s-t**	8,500*
Howard, R. I., **s-d**	15,400*
Kingston, R. I.	2,500*
Ripley, Miss., **w-p-r-t-d**	65,000
Rosebud, Tex., **w-p-r**	21,000
St. Paul, Minn., **t**	15,000
St. Paul, Minn., **t**	31,000
St. Paul, Minn., **s-e**	85,000
St. Paul, Minn., **g-p**	133,000
Santa Anna, Tex., **s-d**	35,000
Shawnee Twnp., Kans., **s-p-t-b-d**	215,000
Smithon, Pa., **p-t-d**	13,000
Spruce Pine, N. C., **d-r-ch**	16,000
Sterling, Mass., **w-p-t-d**	50,000
Sweetwater, Tex., **s-p**	160,000
Tillar WW. Improvement Dist., Drew County, Ark., **p-t-d**	21,000
Uniontown, Ky., **s-p-f-t-d**	76,000
Velva, N. D., **w-p-r**	6,000
Vincent, Ala., **s-p-ch-t-d**	28,000
Wellston, Okla., **d**	6,600
Wentzville, Mo., **w-p-r-t-d**	45,000
Weymouth, Mass., **f**	40,000*
Wrangell, Alaska, **dm**	32,000
Yadkinville, N. C., **w-p-t-ch-d**	44,000
Zion, Ill., **w-p-t**	17,000

Sewers and Disposal Plants

Alma, Wisc.	$13,000*
Breese, Ill.	96,000
Burlingame, Calif.	147,000
Cedarhurst, N. Y.	643,000
Charlotte, Mich.	11,500*
Clarksburg, W. Va.	1,400,000
Cotton Plant, Ark.	41,000
Dixon, Ill.	285,000
Elmira Heights, Chemung Co., N. Y.	488,000
Gallatin, Tenn.	144,000
Greenbay, Wisc.	822,000
Harrison, Ark	125,000
Holton, Kans.	10,200*
Jackson, Mich.	842,000
Kahoka, Mo.	49,000
Kendallville, Ind.	26,500*
Kokomo, Ind.	245,000
Lakeville, Minn.	23,000
Lloyd, N. Y.	161,000
Maryville, Mo.	15,000
Michigan City, Ind.	435,000
Monmouth, Ill.	157,000
Moundridge, Kans.	45,000
Murray, Ky.	100,000
Port Lavaca, Tex.	55,000
Princeton, Ind.	108,000
Red Bud, Ill.	59,000
Richmond, Ind.	140,000*
St. Charles, Ill.	31,000*
Spindale, N. C.	62,000
Stanton, Tex.	34,000
Waverly, Iowa	90,000
Willard, Ohio	187,000

Sewage Plants

Ackley, Iowa	$17,000
Carthage, Ill.	35,000
Clarion, Iowa	30,000
Corning, Iowa	42,000
Crown Point, Ind.	44,000
Eureka Springs, Ark.	12,000
Leominster, Mass.	250,000
Mount Morris, Ill.	30,000
Pratt, Kan.	11,400*
Radnor, Pa.	73,000*
Rhode Island Emergency Public Works Corp., Wallum Lake, R. I.	3,000*
Sun Prairie, Wisc.	7,500*
Washington, D. C. (loan and grant to District of Columbia)	8,000,000
Worcester, Mass.	15,000*
Sac City, Iowa	58,000

Sewers

Braintree, Mass.	$150,000
Cannonsburg, Pa. (also paving)	55,000
Cincinnati, Ohio	46,000*
Dallas, Tex.	21,000*
Elmsford, N. Y.	332,000
Evansville, Ind.	1,172,000
Forest City, Iowa	40,000
Fort Smith, Ark.	35,000
Hamilton Co., O. (Madiera)	190,000
Lincsville, Pa.	13,000
Rock Hill, S. C.	263,000
St. Louis, Mo.	31,200*
St. Louis, Mo.	720,000*
White Plains, N. Y.	296,000
Wilkes-Barre, Pa. (also bridge)	300,000
Wrangell, Alaska	6,500

Storm Sewers

Columbus, Ohio	$1,618,000
Dayton, Ohio	45,000
Ellwood City, Pa.	24,000
Ellwood City, Pa.	73,000
Manhattan, Kans.	12,900*
Wauwatosa, Wisc.	200,000
West Springfield, Mass.	32,000*
White Plains, N. Y.	255,000

Incinerators

Durham, N. C.	$40,000
Franklin, N. H.	12,000

Street or Road Construction

Atwood, Kans.	$26,800
Barkhamsted, Conn.	77,300
Beatty, Minn.	1,700
Bloomfield, Conn.	88,500
Bozrah, Conn.	2,100*
Bristol, Conn.	118,500
Canaan, Conn.	124,000
Cleveland, Ohio	6,300*
Cleveland, Ohio	17,500*
Cornwall, Conn.	95,000
Des Moines, Iowa	900*
Dixon, Ill.	40,000
East Cleveland, Ohio	8,000*
East Haddam, Middlesex County, Conn.	73,000
East Hampton, Conn.	80,000
Essex, Conn.	66,000
Fairfield, Conn.	100,000
Frankfort, Mich.	8,000*
Fremont Co., Randolph, Imogene, Iowa	14,500*
Huron Co., Norwalk, Ohio	11,500*
Hutchinson, Kans.	25,783
Kansas City, Kans.	37,000*
Lebanon, Conn.	153,000
Lewis Run, Pa.	10,000
Madison, Conn.	100,000
Mansfield, O.	1,800*
Mansfield, O.	2,500*
Mansfield, O.	2,600*
Mansfield, O.	3,000*
Mansfield, O.	3,100*
Mansfield, O.	7,400*
Meriden, Conn.	108,000
Middlefield, Conn.	77,600
Milford, Conn.	53,000
Newberry County, S. Car.	98,000
Newington, Conn.	96,000
Norfolk, Conn	122,000
Old Saybrook, Conn	106,000
Oskaloosa, Ia.	3,000*
Preston, Conn.	118,000
Riceville, Iowa	1,500*
Roxbury, Conn.	16,500*
Rutherford Co., Tenn.	9,000*
St. Louis, Mo.	24,000*
St. Louis, Mo.	45,500*
St. Louis, Mo.	99,500*
St. Louis Co., Minn.	2,750,000
Salisbury, Conn.	100,000
Scotland, S. Dak.	1,500*
Scottsboro, Ala.	*59,000
Sharon, Conn.	73,000
Shenandoah, Iowa	58,500*
Sidney-Anderson, Iowa	7,500*
Southbury, Conn.	113,000
State of Ill.	128,800*
Stillwater, Okla.	1,400*
Stoninglon, Conn.	22,500*
Suffolk Co., N. Y.	128,000*
Waterbury, Vt.	4,500*
Westbrook, Conn.	100,000
West Newton, Pa.	24,000
Wilson County, Tenn.	9,000*
Windsor Locks, Hartford Co., Conn.	90,000
Winston-Salem, N. C.	115,000

Bridges

Camden, Mo.	666,000
Cincinnati, Ohio	2,100*
Clinton, Conn.	35,000

Jenkins County, Ga.	14,400
St. Louis, Mo.	105,000*
St. Louis, Mo.	332,300*
State of Ill.	108,700*
State of N. J.	24,000*
Steuben Co., N. Y.	8,400*
Washington, Mo.	428,800

Bridges, Tunnel, Swimming Pool

Allegheny Co., Pa.	$24,500,000

Grade Crossing Elimination

St. Louis, Mo.	$134,900*
St. Louis, Mo.	155,000*
State of New York:	
Bronx	54,000*
Le Roy, N. Y.	57,600*
Mumford, N. Y.	41,500*
Peth, N. Y.	45,000*
Port Richmond, N. Y.	460,000*
Staten Island	211,100*
Staten Island	444,000*
Tompkinsville	385,500*

Flood Control and Drainage

Bay City, Tex.	$33,600*
Cohasset, Mass.	10,000*
Denver, Colo.	469,000
East St. Louis, Ill.	2,360,000
Muscatine, Iowa	3,200*
Port Arthur, Tex.	116,000

Power Plant or Equipment

Greenwood Co., S. C. (Hydro)	2,767,000
Hannibal, Mo. (Turbo Generator)	81,000*
Highland, Ill. (Turbo Generator)	25,000*
Independence, Mo.	52,500*
Memphis, Mo.	8,500*
Monroe City, Mo. (Diesel)	17,000*
Okeene, Okla. (Diesel)	48,000
Osceola, Ark. (Diesel)	52,000
Rhode Island Emergency Public Works Corp.:	
Wallum Lake, R. I.	4,000*
San Antonio, Tex. (Dam, Tunnel, Penstock)	4,500,000*
Sanitary Dist. of Chicago, Ill. (Hydro)	230,000*
Sibley, Ia. (Boiler)	26,000
State of New York, Dept. Correction, Elmira, N. Y.	162,000*
Trenton, Mo. (Diesel)	315,000
Wapakeneta, Ohio (Steam)	146,000
Worthington, Minn. (Turbo Generator)	29,000

Gas Plant or Pipe Line

Troy, Ala.	$68,400
Watseka, Ill.	64,400
Canton, Miss. (Line)	168,000

Miscellaneous

Beaumont, Tex., Steel Grandstand	$3,900*
Burlington, N. C., Fire alarm system	20,000
Deering, N. H.	7,000
Hibbing, Minn., Stadium	6,000*
Jackson Co., Okla., School buses	500*
Jenkintown, Pa., Boilers and electric wiring system	14,770
Juneau, Alaska, Paving, bridges, bulkheads, incinerator, water mains	103,000
Kane Co., Ill., Sprinkler system	2,650*
La Grange, Ga., Swimming pool	7,900*
Loyal, Okla., Power line	7,100
Mott, N. D., Lighting system	600*
New York, N. Y., Steel pier shed	2,020,000
Rhode Island Emergency Public Works Corp., Warwick, R. I., Airport	124,000*
St. Louis, Mo., 5 Municipal parks	157,000*
Sayre, Beckham Co., Okla., Buses	700*
Stowe, Pa., Tunnel highway	319,000
Webb City, Mo., Recreation facilities	10,000*
Hidalgo County, Tex., Irrigation extensions	125,000
New Bedford, Mass., Waterfront improvements	53,000
Wrangell, Alaska, Retaining wall	13,000

Buildings

A. & M. College, Brazos Co., Tex.	9,300*
Aiken County, S. Car.	158,000
Allegheny Co., Pa.	350,000
Allegheny County Home, Woodville, Pa.	2,100,000
Ashton, Ill.	19,000*
Bradley County, Tenn. (Cleveland)	35,000
Burgaw, N. C.	75,000
Calhoun Co., Ark.	10,100
Callaway County, Mo. (Fulton)	42,000
Chelsea, Mass.	86,000
Claremore, Okla.	97,000
Clarksville, Johnson Co., Ark.	125,700
Clay Co., Mo.	75,500*
Forest Glen Park, Cook County, Ill.	35,800
Galva, Kans.	6,000
Gardner, Mass.	53,000*
Hamilton Co., Ohio	175,000
Henderson Co., Ill.	5,800*
Hibbing, Minn.	130,000*
Honolulu, Hawaii	28,500*
Indianapolis, Ind.	38,500*
Jackson Co., Mo.	86,000*
Kalamazoo Co., Mich.	731,000
Kingsville, Tex. (Tex. Coll. of A. & I.)	300,000
Luzerne Co., Pa.	350,000
Mayes County, Okla. (Mazie)	7,900
Memphis, Tenn.	125,000
Memphis, Tenn.	300,000
Merrilton, Ark.	72,500
Molokai, Hawaii	44,500*
Naperville, Ill.	6,500*
Nashua, N. H.	103,500
Oxford, Ohio	72,000
Rhode Island Emergency Public Works Corp.:	
Exeter, R. I.	17,200*
Exeter, R. I.	44,700*
Exeter, R. I.	36,700*
Howard, R. I. (Boiler)	11,800*
Howard, R. I. (Sprinkler)	14,800*
Howard, R. I.	77,000*
Providence, R. I.	44,600*
Wallum Lake, R. I.	7,300*
Wallum Lake, R. I.	9,800*
Wallum Lake, R. I.	40,000*
Wallum Lake, R. I.	43,100*
Rock Island Co., Ill.	14,000
St. Louis, Mo.	347,500*
St. Louis, Mo.	126,000*
St. Louis, Mo.	191,000*
St. Louis, Mo.	483,300*
Sitka, Alaska	87,900*
State of Ill., Jacksonville, Ill.	55,000
State of Ill., Macomb, Ill.	8,500*
State of Missouri, Jefferson City	3,778,000*
State of Texas (Hwy. Dpt.)	22,000*
State Teachers College, Richmond, Ky.	89,000
Territory of Hawaii (Kaneohe)	46,300*
Territory of Hawaii	53,200*
Toledo, Ohio	17,000*
Victoria, Tex.	17,000
Warren, Pa.	38,000
Winston Salem, N. C.	35,000
Worcester, Mass.	168,000*

Schools

Alton, Ill. (Madison Co.)	$21,800*
Amberg, Wis.	23,700
Ames, Story County, Iowa	159,000
Anniston, Ala.	133,000
Atoka, Okla.	34,900
Auburn, Mass.	260,000
Aurora Springs, Mo.	1,650
Barnwell, S. C.	50,000
Bethany, Conn.	9,000*
Bloomington, Ill.	270,000
Brighton, N. Y.	80,000
Brunswick, Ga.	48,000
Caddo Parish, La.	6,400*
Caddo Parish, La.	25,000*
Caldwell Co., N. C.	68,000
Caldwell Co., N. C.	87,000
Catawba Co., N. C.	103,000
Chicopee, Mass.	260,000
Copan, Okla.	56,100
Decora, Iowa	125,000
Derry, Westmoreland Co., Pa.	33,000
Dunklin Co., Mo.	1,800
Dunklin Co., Mo.	27,000
Durham, N. C.	135,000
Enid, Okla.	120,500
Exeter, Pa.	215,000
Farmington, Mo.	10,500*
Fort Mitchell, Kenton Co., Ky.	11,000*
Gasconade, Mo.	6,400
Goodhue Co., Minn.	64,000
Guilford Co., N. C.	323,000
Hancock County, Ga.	50,000
Hempstead, Nassau Co., N. Y.	291,000
Holmes Co., Pickens, Miss.	340*
Hudson, N. Y.	540,000
Huron Co., Mich.	11,000*
Jasper Co., Carthage, Mo.	25,700*
Johnson City, N. Y.	356,000
Jonesboro, Ark.	450,000
Kannapolis, N. C.	58,500
Keene, N. Y.	180,000
Knoxville, Tenn.	406,000
Lawrence, L. I., N. Y.	825,000
LeFors, Tex.	13,900
Les Lacs, N. D.	14,000
Lexington Co., S. C.	120,000
Lincoln, R. I.	200,000
Lincoln Co., Okla.	2,200
Little Rock, Ark.	150,000
Louisville, Ky.	15,500*
Luzerne Co., Hughestown, Pa.	21,500
Mason Co., Ill.	20,000
Merrimack Co., N. H.	28,000
Milford, Mass.	250,000
Montgomery Co., Kan.	6,400
Morgan Co., Mo. (Versailles)	4,940
Nashua, N. H.	575,000
Nassau Co., N. Y.	150,000
Nassau Co., N. Y. (East Rockaway)	295,000
Northbridge, Mass.	33,000*
North Hempstead, N. Y.	440,000
North Hempstead, N. Y.	500,000
Northwood, N. D.	53,800
Oak Bluffs, Mass.	60,000
Ochelata, Okla.	47,200
Okla. Co., Okla. (Deer Creek)	29,000
Omro, Wis.	21,700
Pacific, Mo.	68,000
Pennington Co., S. D.	300*
Piqua, Ohio	42,000
Pomeroy, Ia. (Calhoun Co.)	21,000*
Pottersville, N. Y.	130,000
Reading, Pa.	367,000*
Renwick, Iowa	3,500*
Rockingham County, N. C.	367,000
Rock Island Co., Ill. (Moline)	129,500
Russell, N. Y.	10,500*
Rutherford Co., N. C.	164,700
St. Clair Co., Ill.	213,000
St. Louis Co., Mo.	39,600
Saltsburg, Pa.	50,300
Schuylkill Co., Pa.	140,000
Seneca Falls, N. Y.	20,500*
Symer, Tex.	5,900*
So. Antonio, Tex.	80,000
Spartanburg Co., S. C.	34,000
Stanberry, Mo.	39,800
Sterling, Mass.	50,000
Steward, Ill.	5,000*
Strafford, Mo.	16,900
Tellico Plains, Tenn.	138,700
Texhoma, Okla. (Texas Co.)	34,400
Thayer, Mo. (Oregon Co.)	42,000
Union Co., Pa.	20,130
University of Tenn., Knoxville	135,000
Upshur Co., Tex.	9,500*
Vance Co., N. C.	286,900
Versailles, Mo. (Morgan Co.)	14,000
Vigo Co., Terre Haute, Ind.	23,500*
Wake Co., N. C.	16,200
Wausau, Wis.	64,800*
Wayland, Mass.	106,000
Wayne County, Miss.	51,700
Wellesley, Mass. (gym. and assembly hall)	49,500*
Wellesley, Mass. (elementary school)	49,500*
West Burlington, Ia. (Des Moines Co.)	13,000*
West Plains, Mo.	64,000
White Co., Enfield, Ill.	27,600
Whitehall Township, Pa.	15,700
Whitfield Co., Ga.	16,000

(To be continued next week)

SOCIETY CALENDAR

INTERNATIONAL CITY MANAGERS ASSOCIATION, annual conference, St. Louis, Oct. 15-17.

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS, Annual Meeting, Rochester, N. Y., September 24-28.

INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Annual Meeting, Rochester, N. Y., September 24-28.

NATIONAL SAFETY CONGRESS, annual meeting, Cleveland, Ohio, Oct. 1-5.

AMERICAN PUBLIC HEALTH ASSOCIATION, annual meeting, Pasadena, Calif., Sept. 3-6.

NEW ENGLAND WATER WORKS ASSOCIATION, annual meeting, Boston, Mass., Sept. 18-21.

Personals

GEN. G. B. PILLSBURY, Corps of Engineers, has been reappointed as assistant to the chief of engineers with the rank of brigadier general.

HUGH L. COOPER, consulting engineer, New York, received the degree of doctor of engineering from Rensselaer Polytechnic Institute, Troy, N. Y., at the recent commencement exercises at that institution.

STUART K. KNOX and HORACE H. CHASE have retired from the organization of Nicholas S. Hill, Jr., consulting engineer, New York. Mr. Knox will enter private consulting practice and Mr. Chase will retire from active practice.

ALDRICH DURANT has been appointed business manager of Harvard University. Mr. Durant is CWA engineer for New York state. He was with the MacArthur Brothers Co. from 1910 to 1921 in charge of construction work and later spent some years in sales engineering work.

R. W. SPENCER, recently resident engineer on the Pine Canyon dam of the Pasadena water supply, has joined the staff of the Metropolitan Water District of Southern California. He is investigating some special cements for use on the Colorado river aqueduct.

THOMAS H. ALLEN, state PWA engineer for Tennessee, has been named a member of the Memphis Water Commission. It is expected that he will resign from the public works organization.

CAREY H. BROWN, formerly chairman of the Special Board of Review, Public Works Administration, recently resigned from that position and now is superintendent of engineering and maintenance, Eastman Kodak Co., Kodak Park Works, Rochester, New York.

T. G. McCRORY, for five years chief engineer of the Washington state highway department, has been appointed executive secretary of the crushed stone, sand, gravel and slag code authority for District No. 2 comprising all of western Washington, with headquarters in Seattle.

GEORGE R. COBB has been appointed assistant state engineer for Rhode Island on all CWA work under F. J. Carew, state engineer inspector for Connecticut and Rhode Island. He has recently been assignment officer for all ERA work in the East Providence, Barrington, and Warwick districts. He will be succeeded at East Providence by Edward H. Fuller.

GEORGE F. NICHOLSON, for many years harbor engineer for Los Angeles, has opened an office in Los Angeles (1116 Insurance Exchange Building) as consulting harbor engineer, specializing entirely on harbor work. For many years Mr. Nicholson was chief engineer and executive secretary of the Port of Seattle, prior to his nine years with the Los Angeles harbor.

Obituary

S. S. SMITH, 76, engineer and designer, died in Seneca Falls, N. Y., July 5.

EDMUND K. SWIGART, senior vice-president of the Bucyrus-Erie Co. since 1911, died July 7. He was 67 years old and had been with the Bucyrus-Erie Co. since 1891.

GEORGE SAUERBRUNN, founder of Sauerbrunn Construction Co., St. Louis, died June 28 in Pasadena, Calif., where he had gone fourteen years ago because of ill health. He was 78 years old.

ANDREW H. CALKIN, for many years prominent in the building construction field at Boston, Mass., died at Arlington, Mass., on June 22 at the age of 77.

MISS ANNIE L. WOOD, for 15 years secretary of the Engineering Societies of Boston, died at Belmont, Mass., on June 22 after about two months of ill health. She was a native of Woburn, Mass., and was a member of a family of considerable prominence in Boston engineering circles.

WILLIAM H. SAYWARD, a well known figure in the building construction field in New England and secretary-treasurer of the Master Builders Association of Boston since 1885, died at his home in that city on July 2 at the age of 89.

LOUIS E. RITTER, a consulting engineer of Chicago for about forty years, was found dead in his apartment at the University Club on June 30. He was 70 years old. He was on Mississippi River work in 1890 and later moved to Chicago and entered private practice. The Blackstone and Drake hotels were built under his direction as consulting engineer.

GEORGE ALFRED DAMON, formerly dean of engineering at the California Institute of Technology, Pasadena, died in that city at the age of 63. Graduating from the University of Michigan in 1895 he spent 16 years in railroad and power-plant design, including work on New York subways problems. He was a former president of the City Planning Association of Los Angeles and was the author of several monographs on transportation.

CONSTRUCTION STATISTICS OF THE WEEK

ENGINEERING awards at $18,707,000 are below the average week to date due to low federal, $1,516,000, and private, $2,415,000, totals for the week. State and municipal awards total $14,776,000. These are all well above July last year but below the May and June pace of this year.

Streets and roads awards at $6,140,000 are well above last week and public buildings at $5,437,000 are 250 per cent ahead of last week. Other classification totals are about the same as a week ago except earthwork and drainage which is very low at $192,000.

Large contracts for the week include Bayside High School, New York, $1,356,000; highway lettings by Ohio, $560,000 and by Connecticut $1,652,000; and West Side Intercepting Sewer Contract 9, Chicago, Ill., $978,000.

New capital for the week includes a group of PWA allotments from the new appropriation and adjustments and changes from loans and grants to grants only from last year's appropriation. State and municipal bond sales totalled $5,878,000 for construction purposes.

CONTRACTS
(Thousands of Dollars)

	Weekly Average July 1933	Prev. 4 Weeks	Week July 12 1934
Federal Government	$632	$3,289	$1,516
State and municipal	5,704	13,105	14,776
Total public	$6,336	$16,394	$16,292
Total private	6,261	4,438	2,415
Week's total	$12,598	$20,832	$18,707
Cumulative to date:			
1933	$469,017	1934	$663,217

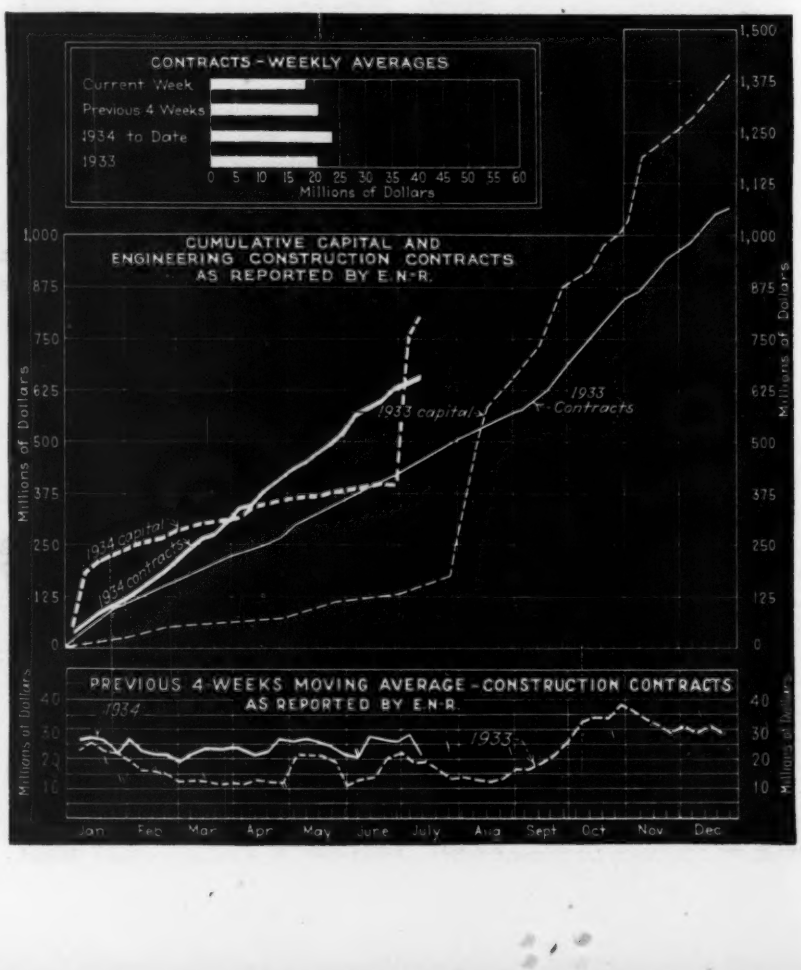
NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

1934	Week July 12	Cumulative
State and municipal	$5,878	$169,327
PWA allotments, S&M	34,808	549,258
RFC loans, S&M	.....	9,413
Corporate issues	377	17,063
PWA allotments, private	489	55,437
Total, Non Federal	$41,552	$800,438
PWA allotments Federal Constr.	929	82,497
Total new capital	$42,481	$882,985
Cumulative to date:		
1933	$171,453	1934	$800,488

NOTE: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

INDEX NUMBER

E.N.-R.- Cost	1913 = 100	1926 = 100	E.N.-R.- Volume	1913 = 100	1926 = 100
July, 1934	**199.65**	**95.97**	**June, 1934**	**119**	**50**
June, 1934	199.61	95.95	May, 1934	101	44
July, 1933	165.50	79.56	June, 1933	109	48
1933 (Av.)	170.18	81.80	1933 (Av.)	102	45
1932 (Av.)	156.97	75.45	1932 (Av.)	127	56
1931 (Av.)	181.35	87.17	1931 (Av.)	220	96.5



CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Ark., Bentonville—City, W. R. Duncan, councilman, making plans waterworks system, $53,000. P.W.A. project. Black & Veach, Mutual Bldg., Kansas City, Mo., engrs. Noted Jan. 11.

Ark., Fort Smith—City allotted $1,600,000 loan and grant by P.W.A. to construct new water supply from Lee Creek, incl. 60 ft. dam, 2,000 ft. long, 10¼ mi. 24 in. c.i. pipe line, etc. W. R. Holway, Tulsa, Okla., engr. Noted Aug. 31, 1933.

Ark., Glenwood—City, J. C. Self, mayor, making plans complete waterworks system, $53,000. P.W.A. project. H. R. Carter, 212 Center St., Little Rock, engrs. Noted June 19.

Ark., Mansfield — City, E. C. Pennington, mayor, making plans waterworks system, $56,000. P.W.A. project. W. L. Winters, Fort Smith, engr.

Ark., Tillar—City, J. H. Kimbro, mayor, making plans waterworks system. $21,000. P.W.A. project. R. E. Williams, 2427 Broadway, Little Rock, engr.

Ark., Waldo—City, H. M. Black, mayor, plans waterworks system, $56,000. P.W.A. project. R. E. Williams, 2427 Broadway, Little Rock, engr.

Calif., Eureka—P.W.A. refused to accept revenue bonds proposed as security for loan toward construction of Mad River water supply system for city. $1,134,000. Another election will be called to authorize general obligation bonds for project. Noted Jan. 11.

Calif., Yreka—City plans water supply system. To exceed $25,000.

Ill., Bethany—City soon takes bids waterworks and distribution system. $48,000 loan and grant allotted by P.W.A.

Ill., Forest—City soon takes bids waterworks incl. 60,000 gal. tank on tower, 30 in. gravel packed well with rotary pump, about 120 ft. deep, 3,400 ft. 8 in. and 2,000 ft. 4 in. c.i. mains, 5 new fire hydrants. $32,000 grant and loan allotted by P.W.A. Warren & Van Praag, Millikin Bldg., Decatur, engrs. Noted Mar. 29.

Ill., Ramsey—City rejected bids May 8, 125 ft. deep well, pumps, motors, tanks on tower, distribution mains, hydrants, valves and boxes, $34,000. Will readvertise. W. A. Fuller Co., 2916 Shenandoah Ave., St. Louis, Mo., engrs. P.W.A. project.

Ind., Fort Wayne—City plans 2nd dam in river for water storage. $185,000. $53,000 granted by P.W.A. Hoad, Decker, Shoecraft & Drury, Ann Arbor, Mich., engrs. Noted Feb. 8.

Ind., Laporte—City, A. J. Miller, mayor, making plans waterworks, plant. $190,000 P.W.A. loan approved and granted.

Kan., Chanute—City, election Aug. 7, $35,000 water softening plant. R. B. Reeves, Chanute, engr. Noted Oct. 5.

Kan., Endora—City defeated bonds for complete waterworks system. Schockley Eng. Co., 800 Graphic Arts Bldg., Kansas City, Mo., engrs. Noted May 31.

Kan., Hanover—City soon takes bids waterworks improvements, concrete construction gravity filter type and industrial type with pressure filter, water softening plant, also 200 g.p.m. pump and well. Est. about $16,000 Bonds voted for same. Wilson Eng. Co., Farmers Union Bldg., Salina, engrs. Noted July 5.

Mich., Muskegon—City, completing plans for waterworks filter plant, incl. pumping station, filter plant, 1 story, basement, 40x70 ft. central building, 4 high pressure pumps, motor driven, water filtration plant, equipment, piping, etc. $40,000. H. Lewis, city engr. Greeley & Hanson, 6 North Michigan Ave., Chicago, Ill., consult. engrs.

Minn., Rockville—Village soon takes bids complete waterworks system. $15,000 (not official). P.W.A. project. M. B. Lang, 914 4th Ave. S., St. Cloud, engr. Noted Oct. 20 Daily.

Mo., Adrain—City soon takes bids waterworks and distribution system. $49,000 loan and grant allotted by P.W.A. E. T. Archer & Co., 609 New England Bldg., Kansas City, engrs. Noted Mar. 8.

Mo., Dexter—City plans improving and extending municipal water distribution system. $12,000 loan and grant allotted by P.W.A. Noted Dec. 21.

Mo., Lancaster—City soon takes bids complete waterworks and distribution system. $55,000 loan and grant allotted by P.W.A. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs. Noted Feb. 22.

Mo., Monett—City soon takes bids waterworks improvements and extensions. $32,000 loan and grant allotted by P.W.A. L. W. Adams, Monett, engr. Burns & McDonnell Eng. Co., 107 West Linwood Ave., Kansas City, engrs. Noted Apr. 26.

Mo., Wentzville—City soon takes bids waterworks system, incl. wells, pumps, tank on tower, 2- to 8-in. c.i. mains, hydrants, valves. $45,000 loan and grant allotted by P.W.A. Russell & Axon, 4903 Delmar Blvd., St. Louis, engrs. Noted Oct. 5.

N. Y., Batavia—City plans election in August, to vote on bond issue of not more than $100,000 for construction 1½ m.g. water tank, $96,000. C. Hartley, mayor.

N. Y., Brentwood — Brentwood Municipal Water Dist. plans waterworks. H. C. Stevens, c/o owner, engr.

N. Y., Olean—City plans improving municipal waterworks system. P.W.A. approved $109,000 loan and grant. **Maturity this fall.** F. W. Forness, mayor.

Okla., Hinton—City bids in September waterworks extensions and improvements. $15,000. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs. Noted May 17.

Okla., Shawnee—City plans waterworks system, $750,000. Funds allotted by P.W.A. T. D. Thompson, Shawnee, engr. Noted Apr. 19.

Tex., Abbott—City, c/o L. C. Barnett, secy., plans watertank, $3,500 P.W.A. allotment approved. J. Rady, 400 Majestic Bldg., Fort Worth, engr. Noted Aug. 24.

Tex., Aransas Pass—City, c/o C. S. Bolton, mayor, plans water and sewer improvements, $37,000 P.W.A. allotment approved. L. B. Griffith, 404 Sherman Bldg., Corpus Christi, engrs.

Tex., Athens—City, c/o E. B. Gaunt, mayor, plans water and sewer extensions. $89,370 P.W.A. allotment approved. Willard & Conrad, Esperson Bldg., Houston, engrs. Noted Jan. 11.

Tex., Bartlett—City, c/o R. W. Miller, mayor, plans waterworks extensions, incl. c.i. pipe, $15,000 P.W.A. allotment approved. J. Rady, 400 Majestic Bldg., Fort Worth, engr. Noted Sept. 21.

Tex., Brownwood—City, c/o W. A. Butler, mayor, plans waterworks improvements. $31,868 P.W.A. allotment approved. Mark Ragsdale, Brownwood, engr. Noted Aug. 10.

Tex., Carrizzo Springs—City, c/o G. J. Jeffrey, mayor, plans waterworks and sewer improvements. $49,973. P.W.A. allotment approved. C. H. Mullins, Carrizzo Springs, engr. Noted July 13, 1933.

Tex., Crockett—City, c/o H. J. Troube, plans waterworks, treatment plant, water well and pumping station. $71,500 P.W.A. allotment approved. Engineering Service Corp., Shell Bldg., Houston, engrs. Noted Nov. 30.

Tex., Crystal City—City, c/o V. H. Holsomback, mayor, plans waterworks extensions, deep well, pumping station, venturi meters. $20,000 P.W.A. allotment approved. A. P. Hancock, Kerrville, engr.

Tex., Fredericksburg—City, c/o E. Krauskopf, mayor, plans waterworks system and sanitary sewers. $63,000 P.W.A. allotment approved. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs. Noted Dec. 14.

Tex., Goose Creek—City, c/o H. Widdon, secy., plans water and sewer extensions, incl. 2 and 6 in. c.i. water lines and 6- to 10-in. vitr. clay sewer lines. $28,000 P.W.A. allotment approved. D. M. Duller, 1618 2nd Natl. Bank Bldg., Houston, engr.

Tex., Haskell—City, c/o E. Menefee, mayor, plans waterworks improvements, incl. elevated and surface storage tanks, additional c.i. mains, chlorinators, and pumping equipment. $45,000 P.W.A. allotment approved. Morey & Morey, Praetorian Bldg., Dallas, engrs. Noted Jan. 11.

Tex., Kerens—City, c/o H. Brister, mayor, plans waterworks improvements. $65,000 P.W.A. allotment approved. Municipal Eng. Co., Burt Bldg., Dallas, engrs. Noted Nov. 23.

Tex., Littlefield—City, c/o W. D. Sireet, mayor, plans waterworks improvements, incl. well, pumps, power house, pipe and transmission lines. $47,750 P.W.A. allotment approved. H. N. Roberts, Lubbock, engr. Noted Oct. 12.

Tex., McKinney—City, c/o Secretary, voted $40,000 bonds for waterworks, incl. drilling deep water well, new pumphouse, extension to watermains, new pumping equipment. $51,000. P.W.A. project. Koch & Fowler, 801 Central Bank Bldg., engrs. Noted May 31.

Tex., Pecos—City, c/o B. A. Toliver, mayor, plans waterworks system and supply. $300,000 P.W.A. allotment approved. B. G. Warner, Pecos, engr. Noted Nov. 23.

Tex., Rosebud—City, c/o E. A. Donaldson, mayor, plans waterworks improvements. $20,000 P.W.A. allotment approved. V. B. Harris, Rosebud, engr. Noted Oct. 26.

Tex., Santa Anna—City, c/o W. E. Baxter, mayor, plans waterworks improvements. $35,120 P.W.A. allotment approved. M. M. Moseley & Associates, Coleman, engrs. Noted Jan. 11.

Tex., Sweetwater—City, c/o S. H. Bothwell, mgr., waterworks addition, incl. pipe line and pump station. $160,000 P.W.A. allotment approved. Hawley, Freese & Nichols, Capps Bldg., Fort Worth, engrs. Noted Jan. 11.

Tex., Whitesboro—City, c/o W. R. Younger, mayor, plans waterworks extension, incl. water well, pump house and equipment. Est. $15,000. $4,500 P.W.A. allotment approved. F. J. Von Zuben, 820 Fair Bldg., Fort Worth, engr. Noted Nov. 23.

Ont., Blenheim—Public Utilities Comn., E. Todd, chn., plans securing additional water supply, and is considering a plan to sink additional wells and install a pump. Interested in prices and information.

BIDS ASKED

Ga., Buford—See "Contracts Awarded."

Ind., North Vernon—July 20 (extended date), by City, waterworks system. $25,000. P.W.A. project. C. Hurd, Architects Bldg., Indianapolis, engr. Noted June 14.

Ia., Shenandoah—July 23, by City, water treatment and pumping station structures; furnishing, installing station connecting piping, valves, fittings, heating, drainage, pumping system, etc.; pumping equipment, station light and wiring; elevated water tank; waterworks extention, diesel power generator unit or units. $125,000. Allen & Vogtborg, Inc., 205 West Wacker Dr., Chicago, Ill., engrs. Noted Dec. 5.

Mass., Boston—July 16, by City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, furnishing, relaying and laying 8 in. and up c.i. water pipe, in Arborway, West Roxbury. P.W.A. Docket 7223 (part). To exceed $50,000. $350,000 loan and grant for total project.

Okla., Nowata—July 26, by E. Young, city mgr., filter plant additions, extending mains and repairing waterworks. $21,000. P.W.A. project. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs. Noted Dec. 14.

S. C., Williamstown—July 17, by H. V. H. Cooley, mayor, waterworks and sewerage systems, incl. installing filtration plant, elevated tank, sewage disposal plant. $135,000. Harwood Beebe Co., Spartanburg, engr. Noted Sept. 28.

Wis., Waupau—July 26, by City, J. E. Darling, Jr., chn., constructing 100,000 gal. water softening and iron removal plant for water supply, incl. 3 story, 30x50 ft. building and structure, clarifier equipment, mixing equipment, carbonating equipment, filter and feed equipment, water meter and deep well turbine. $50,000. Alvord, Burdick & Howson, 20 North Wacker Dr., Chicago, Ill., engrs.

Ont., Burlington—See "Contracts Awarded."

CONTRACTS AWARDED

Ark., Des Arc—City Council, Dr. J. H. Gibson, mayor, complete waterworks system, to McEachin & McEachin, Southern Bldg., Little Rock, $34,286. P.W.A. Bids June 11, awarded June 11. Noted Jan. 18.

Ark., Stamps—City Council, Dr. E. D. Brown, mayor, supplying meters for complete waterworks project, to National Meter Co., Dallas, Tex., $2,117. P.W.A. Bids June 14, awarded June 14. All other bids rejected, plans being revised and will readvertise. Noted June 7.

Calif., San Francisco—Western Pipe & Steel Co. of California, general contractors, 444 Market St., excavation and concrete work, in

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Federal Government projects are classified under heading denoting type of work and designated by symbol of †

†*Federal Government.*

For official proposal advertising see Searchlight Section

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Waterworks (Continued)

connection with San Francisco Bay Crossing Pipe Line 2, for City and San Francisco Co., to Youdall Constr. Co., Matson Bldg. Noted June 28, under "Contracts Awarded."

Ga., Buford—City, c/o Mayor, constructing pump house, dam, reservoir, filtration plant, watermains, day labor. Owners taking bids on reinforced steel, also purchasing materials as needed. F.E.R.A. and City financing. Robert & Son, Bona Allen Bldg., Atlanta, engrs. Noted Feb. 8.

Ga., Union Point—City, c/o Mayor, Union Point, constructing waterworks system, to Smith Pew Constr. Co., 435 Irwin St N.E., Atlanta. Est. $40,000. **P.W.A.** Awarded June 29. Noted Mar. 29.

Ill., Knoxville—City, drilling new 1,360 lin.ft. 10 in. well and repairing old well, to C. W. Varner, Dubuque, Ia., $11,865. Est. $13,000. **P.W.A.** Bids June 29. Noted June 21.

Ill., Ridgefarm — City, gravel walled well brick, pumping station, pumping equipment, elevated tank and water distribution system, to J. W. Montgomery, Danville, $43,089. Est. $53,000. **P.W.A.** Bids June 7. Noted May 31.

Ill., Vienna—City, deep well, pumping equipment, brick pumping station, steel tank on tower, complete water distribution, c.i. mains hydrants, valves and boxes, to Cameron Joyce & Co., 17 South 7th St., Keokuk, Ia., $49,968. Est. $60,000. **P.W.A.** Noted May 31.

Ind., Hope — Town, waterworks plant, to Ostrom Realty & Constr. Co., 624 Peoples Bank Bldg., Indianapolis, $41,895. Est. $56,000. **P.W.A.** Bids May 15. Noted May 3.

Ind., Newcastle—City, C. Schoel, supt., waterworks, incl. diesel engine, generator, auxiliary equipment, to DeLavergne Engine Co., Chester Park and Simpson St., Phila., Pa., $52,000.

Ind., Oldenburg—City, constructing supply line and distribution system, to Weis & Horan, Anderson. **P.W.A.**

Ia., Vinton—State Bd. Educ., water distributing plant, at State School for Blind, to C. W. Roland, 1347 8th St., Des Moines, $16,366. **P.W.A.** O. Thomas, Des Moines, archt.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, laying 48 in. c.i. water pipe main in Brookline Ave., to C. & R. Constr. Co., 75 Bradeen St., Roslindale, $218,305. **P.W.A.** Bids June 20, awarded June 29. Noted June 14.

Mass., Bridgewater — Commonwealth of Massachusetts, Dpt. Correction, State House, constructing 1 m.g.c. steel storage tank and 150,000 gal. steel gravity tank, to Chicago Bridge & Iron Wks., 250 Stuart St., Boston, $22,300***furnishing, installing sprinklers and other fire prevention equipment, to Raisler Sprinkler Co., 129 Amsterdam Ave., New York, $51,661. **P.W.A.** Bids May 25, awarded June 26. Noted May 17.

Mass., Great Barrington—Prudential Com. of Great Barrington Fire Dist., E. Kelley, clk., constructing two 1 story, 30x38 ft. concrete, brick pumping stations, to L. P. Federico & Son, 43 Westwood St., Dorchester, $10,620; pumping equipment, to Turbine Equipment Co. of New England, 80 Federal St., Boston, $14,457. Bids May 29. Noted May 24.

Mass., Newburyport—City, Water Dpt., City Hall, furnishing pumping equipment for P.W.A. project, to N. L. C. Eng. & Equipment Co., 101 Tremont St., Boston, $7,300. Bids June 23, awarded June 29. Whitman & Howard, 89 Broad St., Boston, engrs. **P.W.A.** Noted Feb. 22.

Mass., Worcester—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, constructing steel standpipe at State Hopital, to Chicago Bridge & Iron Wks., 250 Stuart St., Boston, $18,850***foundation for same, to Pasquale Constr. Co., 91 Williams St., Jamaica Plain, $3,759***force main, to Ralph Sust, 60 Olney St., Dorchester. **P.W.A.** Noted June 7.

Mo., Hornersville—City, waterworks and distribution system, incl. well and strainer, pump house building, concrete foundations, well cap, pumping equipment, chlorinator, tank on tower, distribution system, to Dunbar & Simon, 7520 Buckingham Dr., Clayton, $28,297, using hand labor in trenches. Est. $29,000. **P.W.A.** Bids June 22. Noted Apr. 19.

N. J., New Brunswick—East Brunswick Twp. water supply system in Tanners Corner Section, to A. S. Mundy, Woodbridge, $07,124. Noted July 5.

†**N. Y., Canandaigua**—Vet. Bu., Arlington Bldg., Wash., D. C., steel water tank and tower, to Chicago Bridge & Iron Co., 17 Walnut St., Phila., Pa., $11,140. Bids June 28. Noted June 21.

N. Y., South Jamaica—Jamaica Water Supply, 161-20 89th Ave., Jamaica, steel water tank, 107th Ave. and East 178th St., to Chicago Bridge & Iron Wks., 165 Bway., New York, and Chicago, Ill.; other work by day labor and separate contracts all of which have been awarded. To exceed $17,000. Noted July 5.

N. C., Madison—Mayor & Bd. Aldermen, waterworks improvements, drilling casing 1 or 2 eight in. wells to yield water supply of 50 gpm., to Virginia Mchy. & Well Co., 1319 East Main St., Richmond Va., $2,370. **P.W.A.** Bids June 1.

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N. C., Rocky Mount—Mayor and Bd. Aldermen, to Chicago Bridge & Iron Wks., 1500 North 50th St., Birmingham, Ala., elevated steel tank and tower, $54,800***to D. J. Rose, Rocky Mount, tank foundations, $5,950; concrete valve vault, $663; chain link fence $850***to Glamorgan Pipe & Fdry. Co., Lynchburg, Va., $11,248***to Chapman Valve Mfg. Co., Indian Orchard, Mass., flanged gate valves, $1,254; water main valves, $1,749***to Harrison-Wright Co., 116 West 3rd St., Charlotte, pipe laying $10,870***to R. D. Wood, Chestnut St., Phila., Pa., fire hydrants, $582***to Grinnell Co., 1431 West Morehead St., Charlotte, 16 in. altitude valves, $990; 12 in. altitude valves $680***to Bailey Meter Co., 1038 Ivanhoe Rd., Cleveland, O., water level indicator and recorder, $625. Grand total $90,267. Est. $310,000. **P.W.A.** Bids June 14. Noted June 7.

Tex., Bridgeport—City Council, constructing municipal waterworks and sewerage systems with exception of 175,000 gal. steel tank, to Central Constr. Co., Dallas, approximately $125,000. **P.W.A.** P. W. A. approved $145,000 loan and grant. Noted June 7.

Tex., Dallas—City, constructing watermain extension in Austin and Young Sts. to Oak Cliff Pumping Station, Plan B, using c.i. pipe, Class C, to Dellone Constr. Co., 300 North Henderson St., $83,359. Est. $75,000. Awarded June 27.

Vt., St. Johnsbury—Village, Trustees, Contr. 1, unload, haul and lay 18,000 lin.ft. 14, 16 and 20 in. c.i. pipe and appurtenances, to H. P. Cummings Constr. Co., 14 Prospect St., Ware, Mass., $34,423. **P.W.A.** Bids June 16, awarded July 2. Noted May 31.

Wis., Madison—City, A. W. Bares, clk., laying watermains, to J. R. Cullinane Co., 618 Dayton St., Madison, $21,875***furnishing pipe, to Central Fdry. Co., 1659 Wellington St., Chicago, Ill., $35,684***deep well turbine pump and well, to W. L. Thorne Co., Des Plaines, Ill., $18,496. Grand total $76,055. **P.W.A.** Bids June 20.

Wis., Two Rivers—City, constructing water filtration plant, to Pacholski & Doligalski, 607 West Mitchell St., Milwauke, $72,247. Bids June 7. Noted May 31.

Ont., Burlington—Burlington Water Comn. furnishing 40,000 gal. steel water tank to be erected at Freeman, to Hugh Wilson, Oakville, $800; erecting tank, to Hill Constr. Co., Hamilton, $1,740. Awarded June 18. J. J. Hobson, town clk., taking bids concrete foundations for same. Noted May 3.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Ark., Cotton Plant — City soon takes bids sanitary and storm sewers in various streets. P.W.A. allotted $41,000 grant and loan. Dickinson & White, Rector Bldg., Little Rock, engrs.

Ark., Fort Smith—City soon takes bids sewers in various streets. $35,000 allotted by P.W.A. W. R. Holway, Tulsa, Okla., engr. Noted Aug. 31, 1933.

Ill., Chicago—Sanitary Dist. of Chicago voted approval of supplemental loan agreement with Federal government, paving the way for an initial call for bids on West-South West Sewage Treatment works. $21,000,000. This new agreement made necessary by revision of construction plans ordered by a Federal Board of Review and replaces that under which the government loaned the District $42,000,000 last December. Part of project to begin actual construction by Sept. 1. P. Harrington, 910 South Michigan Ave., engr.

Ill., Mount Morris—City soon takes bids complete sewage disposal plant, auxiliary piping. $30,000 grant and loan allotted by P.W.A.

Ill., Red Bud—City soon takes bids sanitary sewerage system, incl. disposal plant, 30,500 ft. 8- to 15-in. sewers. $59,000 allotted by P.W.A. Kinsey Eng. Co., Pekin, engrs. Noted Dec. 14.

Ind., Brownstown—City making plans storm sewers in Water, Poplar, and Bridge Sts.

Ind., Evansville—City making plans sewers. $1,171,000. P.W.A. loan approved and granted. J. J. Saunders, Evansville, engr.

Ind., Hammond—City making plans 18 and 24 in. vitr. sanitary sewer in Calumet Ave. F. A. Blocker, Hammond, engr.

Ind., Kendallville—City plans intercepting sewers and sewage disposal plant. $100,000. $26,000 P.W.A. grant allotted. C. Hurd, Architects Bldg., Indianapolis, engr. Noted Jan. 11.

Ind., New Bethel—City making plans sanitary sewer. B. Short, Indianapolis, engr.

Ind., Princeton—City making plans sewage disposal plant. $110,000. P.W.A. loan and grant approved. Finch & Babcock, 276 Century Bldg., Indianapolis, engrs. Noted Feb. 15.

Kan., Manhattan—City soon takes bids storm sewerage system, incl. 2,500 lin.ft. 60 to 72-in. concrete segment block, or concrete box main sewer, necessary inlets and connection lines. Total est. $46,000. P.W.A. approved $2,900 grant. Noted Jan. 11. Wilson Eng. Co., Farmers Union Bldg., Salina, engrs. Noted Jan. 11.

Mich., Paw Paw—F. A. Racette, village pres., working drawings in progress and takes bids about July 19, for sewage treatment plant and outflow sewer, incl. outflow sewers, c.i. pipe, drying beds, control building, 2 sewage pumps with 1 story pumping station. $27,000. Former bids rejected. Consoer, Townsend, Olver & Quinlan, 205 West Wacker Dr., Chicago, Ill., engrs.

Mo., Kahoka—City soon takes bids sewage disposal plant, auxiliary piping and sewer connections, sewerage system. $49,000 loan and grant allotted by P.W.A. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engrs. Noted Dec. 7.

Mo., Monett—City election July 12, bonds for sewage disposal plant, $50,000. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, engrs. Noted Apr. 28.

N. Y., Freeport—Election July 31, $100,000 for extending municipal sewers and disposal plant. R. E. Patterson, mayor. Noted July 5.

N. Y., Lockport—City plans municipal incinerating plant. $60,000. P.W.A. approved grant and loan. Noted Dec. 21.

Pa., Radnor Twp.—Radnor Twp. plans constructing sewage disposal plant and sanitary sewerage system. $250,000. P.W.A. grant $73,000. C. F. Mebus, Easton Rd., Glenside, engr. Seeburger & Rabenold, 1524 Chestnut St., Phila., archt.

S. C., Williamstown—See "Waterworks."

Tex., Aransas Pass—See "Waterworks."

Tex., Athens—See "Waterworks."

Tex., Dayton—City, c/o L. T. Tadlock, mayor, plans complete new sanitary sewerage system. $32,000. Plans complete, submitted to P.W.A. for approval. E. L. Dalton, Dallas Bank & Trust Co., Dallas, engrs. Noted June 14.

Tex., Goose Creek—See "Waterworks."

Wis., Milwaukee — Milwaukee Sewerage Comn. plans furnishing, erecting steel and wrought iron gratings for sewage plant extension. $60,000. P.W.A. project. D. W. Townsend, Milwaukee, acting ch. engr.

BIDS ASKED

Ala., Talladega—City bids about July 17, sewage disposal plant, complete with auxiliary piping connections, etc. $27,000. P.W.A. project.

Conn., New Canaan—Town taking bids sanitary sewerage system, incl. pipe mains and pumping facilities. $88,000. P.W.A. project. T. F. Bowe, 110 William St., New York, engr. Noted Mar. 8.

Ind., North Vernon—July 20, by City, W. H. Stemm, mayor, sewage disposal plant. $43,000. C. Hurd, Architects Bldg., Indianapolis, engr. Noted Feb. 15.

Ky., Lexington—July 23, by City, at office B. Herr, city clk., Contr. 6, storm water sewers, Northern Dist. Trunk sewer, incl. railroad culvert, 5,200 ft. 21- to 60-in. rein.-con. storm sewers, 1,800 ft. 8 in. vitr. sanitary sewer, underground sewage pumping station, equipped with two 75 g.p.m. units, 250 ft. 6 in. c.i. force main and all accessories; Contr. 7, sanitary sewers, Herr Park, South Bway. Dist., 5,000 ft. 8- to 10-in. vitr. tile sewer, underground sewage pumping station, two 350 g.p.m. units, 1,900 ft. 8 in. c.i. force main and all accessories; Contr. 8, sanitary sewers Spiegel Hill Dist., 4,300 ft. 6- to 24-in. vitr. tile sewer, retaining wall, siphon chambers, 2,400 ft. 6- to 10-in. c.i. main. Plans and specifications at offices of Fuller & McClintock, Municipal Bldg., Lexington, and 11 Park Pl., New York.

Mass., Boston—July 17, by C. J. Carven, comr. Room 508, City Hall Annex, concrete or vitr. clay sewer lines, P.W.A. Project, Docket 4193, in Ashmont St. between Adanac and Neponset Aves. and Ashmont St. outlet in private land, Dorchester; July 18, Hyde Park Ave., in Hyde Park and West Roxbury.

N. Y., Brooklyn—July 18, by R. V. Ingersoll, pres. Brooklyn Boro, Boro Hall, storm and sanitary sewers in Avenue W, Delamere, Elmore and Mansfield Pls., East 2nd, East 4th, East 3rd, 86th, Lake and West 6th Sts.

N. Y., St. George—July 18, by J. A. Palma, pres. Richmond Boro, Boro Hall, constructing sanitary sewers in Queen St., from Bradley to Wellbrook Aves., and from Livingston to Wellbrook Ave. $26,613.

Tex., Austin — July 21, by University of Texas, Bd. Regents, c/o J. W. Calhoun, comptroller, 900 ft. 30 in. and 600 ft. 60 in. rein.-con. storm sewer in Speedway to Waller Creek, University Campus. W. W. Dornberger, Austin, supervy. archt.

Va., Sandston—July 17, by Bd. Supervs. Henrico Co., Court House, 22nd and Main St., Richmond, constructing outfall sewer extension, sewage treatment plant, steel water tank, etc., known as Henrico Sanitary Dist. 2. R. S. Royer, 207 Builders Exch. Bldg., Richmond, consult. engr.

Ont., Ottawa—See "Contracts Awarded."

CONTRACTS AWARDED

Ark., Searcy—City, sanitary sewer extension, outfall sewer and sewage disposal works, to McEachin & McEachin, Southern Bldg., Little Rock, $44,761. Est. $55,000. **P.W.A.** Bids Mar. 13, this was held on account of Bd. Constr. Apr. 19, approved June 28. Noted Mar. 22.

Calif., San Francisco—S. J. Hester, secy. Dpt. P. Wks., City Hall, constructing sewers in

†*Federal Government.*

sewerage, etc. (Continued)

Sloat Blvd. and 44th Ave., involving 689 ft. 2 ft. 6 in. x 3 ft. 9 in. and 1,130 ft. 2 ft. x 3 ft. rein.-con. sewer, 453 ft. 21 in. and 120 ft. 12 in. vitr. clay sewer, to E. J. Treacy, Call Bldg., $16,768. **P.W.A.** Bids June 27, awarded July 6.

Ill., Chicago—Sanitary Dist. of Chicago, constructing West Side Intercepting Sewers, Contr. 9, to Pachen Bros. Constr. Co., 33 North LaSalle St., $977,972. Bids June 21, awarded June 28. Noted June 7.

Ind., Greencastle—City, sewage plant, to American Solvent Recovery Corp., 83 South High St., Columbus, O., $44,960. Est. $62,500. Bids July 2.

Ia., Centerville—City, sewage disposal plant, to L. J. Peters, 3915 University Ave., Des Moines, $26,721. **P.W.A.** Est. $27,000. Noted Dec. 5.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, constructing Sect. 13 of Stony Brook Sewer between Neponset Ave. and Mt. Hope St., West Roxbury, to Geo. A. Fuller Co., 11 Beacon St., $74,640. **P.W.A.** Bids June 22, awarded July 3.

Minn., Moorhead—City, sewage treatment plant and collector system, to Barnett & Record Co., 700 Flour Exchange Bldg., Minneapolis, $173,425. **P.W.A.** Bids June 26. Noted June 14.

Minn., St. Paul—Minneapolis-St. Paul Sanitary Dist., 1823 University Ave., Constr. 102, Div. C, Job 330, constructing 8x12 ft. shaft, 94 ft. deep, at College Ave. near Wabasha St., to Christensen Contractors, Inc., 17 East 5th St., $12,647. **P.W.A.** Bids June 19. Noted June 28.

Mo., Brookfield—City, sewage treatment plant, incl. primary clarifier, secondary clarifier, excavation, concrete work, tile pipe, c.i. pipe, pumps, to Municipal Serv. Co., Dwight Bldg., Kansas City, $48,037. **P.W.A.** Bids June 20. Noted June 7.

N. Y., Penn Yan — City sludge bed glass covers for sewage disposal works, to Lord & Burnham Co., 2 Main St., Irvington, $3,026. **P.W.A.** Noted June 21, under "Contracts Awarded."

O., Cincinnati—Hamilton Co., constructing Muddy Creek Sanitary Outfall Sewer 46, Schedule A, involving 5,458 ft. 30, 39 and 45 in. rein.-con. pipe and 5,458 ft. 8 in. vitr. clay pipe, to R. F. Runck, 6011 Belmont St., $98,-179. Est. $104,777. **P.W.A.**

Ont., Ottawa—City, relief sewers in Alexander, Besserer, O'Connor, and Henderson Sts., day labor, $31,820. F. C. Askwith, City Hall, engr.

Que., Westmount—City, sewer in Landsdown Ave., to Atlas Constr. Co. Ltd. of Montreal, $90,600. P. Jarman, engr.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Ark., Pine Bluff—Arkansas Power & Light Co. making surveys new bridge over Mississippi River, near Greenville, $25,000.

Ill., Chicago—Bd. Local Impvts., City Hall, awaiting government grant of $500,000 after which detailed plans will be submitted to various governing and interested bodies for final approval when bids will be advertised for **(a)** substructure **(b)** superstructure **(c)** sewer work **(d)** street work **(e)** viaduct **(f)** street lighting **(g)** houses and inclosures **(h)** electric operating and control equipment for bascule type bridge over Ashland Ave. and North Branch Chicago River, $1,716,000. M. B. Reynolds, city engr., T. G. Pihlfeldt, City Hall, bridge engr. Noted Apr. 19.

Mo., Washington—City soon takes bids rein.-con. steel vehicular and pedestrian bridge to carry Hy. 47 over Missouri River, $428,000 grant and loan allotted by P.W.A. Sverdrup & Parcel, 2095 Railway Exch. Bldg., St. Louis, engrs. Noted Dec. 5.

N. Y., Hornell—City soon takes bids steel, concrete bridge over Canisteo River, at junction of Main St. $40,000. L. F. Wheatley, mayor. Noted Apr. 12.

Pa., Smith's Ferry—Pittsburgh Coal Co., Oliver Bldg., Pittsburgh, plans bridge across Ohio River, here, and extending railroad line to Midland.

Texas—State Hy. Comn., J. Wood, chn., Austin, plans 3 bridges and Gulf, Colorado & Santa Fe Ry. overpass, Hy. 8, S.P. 159-A, Shelby Co., T. E. Huffman, Lufkin, div. engr.; Texas and Pacific Ry. overpass, west of Big Springs, on Hy. 1, Federal Project 235, Howard Co., W. A. French, Abilene, div. engr.; bridge over Lampasas River, Hy. 2, P. 644-A, Bell Co., E. C. Woodward, Waco, div. engr.; bridge over Tank, Stinking Creek and Salt Ford, Brazos River, Hy. 18, F.P. 587-C, Stonewall Co., W. A. French, Abilene, div. engr.

Texas—State Hy. Comn., J. Wood, chn., Austin, making plans widening Brushy Creek Bridge and approaches, Hy. 43, Williamson Co.; constructing Elm and Menzie Creek bridges and approaches, Hy. 151, Menard Co.; bridge over Novidad River, Hy. 111, S.P. 1070, Jackson Co.; Bridge over Chambers Creek, Hy. 22 Navarro Co.; constructing Texas & Pacific Ry. underpass and Mill Creek and Town Branch Bridges, Hy. 66, S.P. 1029 E, Palo Pinto Co.; making preliminary plans bridge over San Gabriel River, Hy. 2, F.P. 140, Williamson Co.

Texas—State Hy. Comn. J. Wood, chn., Austin, plans widening causeway roadway over Galveston Bay, from 19 to 21 ft. $1,400,000. Application made to P.W.A. for $1,369,775 grant. G. G. Wickline, Austin, bridge engr.

Wash., Bellingham — City Planning Comn., applied to State Hy. Dpt. for funds to construct Cornwall Ave. Bridge $35,000; Commercial St. Bridge $50,000; Eldridge Ave. Bridge $60,000.

BIDS ASKED

Illinois—July 24, by Dpt. P. Wks. & Buildings, Div. Hys., Springfield, rein.-con. substructure, furnishing, fabricating and delivering steel and installing and erecting steel, for bridge over C.&W.I.R.R. and N.Y.C. and St.L.R.R. subway structures at 95th St. and Stoney Ave., Chicago, NRM 245, Route SA 173, Sect. 1515SB, NRM2, Cook Co. E. Lieberman, ch. hy. engr.

Ind., South Bend—July 17, by New York Central R.R. Co., at office State Hy. Comn., Indianapolis, constructing Western Avenue Subway on NRM 82, Sect. C, Structure 2-G 2020, State Rd. 2.

†**Mass., Bourne**—July 17, by U. S. Eng., Custom House, Boston, constructing underpass at north approach to New Bourne Bridge over Cape Cod Canal, adv. EN-R July 12.

Missouri—July 20, by State Hy. Dpt., Jefferson City, constructing bridges over East Creek, Pilot Grove Overflow and Pilot Grove Creek, Gillman-Gallatin Rd., Route SK, Daviess Co.; over Squaw Creek Ditch, over Grand Ave. Creek, over Kinsey, Little Tarkio and Holley Creeks, on Rulo-Forest City Rd., Route SJ, Holt Co.; over Broomer Branch, over Hiwassee Creek, and over Crawford Branch, Warsaw to Fairfield, Route SE, Benton Co.; over stream, over Mount Creek, road from Bogard West, Route SJ, Carroll Co.; over Terre Bleue Creek, Farmington North Rd., Route SD, Francois Co.; over Sawmill Creek, Route 32, St. Genevieve Co.; over stream and over Greasy Creek, Route 65-Chanty Rd., Route SM, Dallas Co.; over Fenton Creek, Fenton-Jefferson Co. Rd., Route SJ, St. Louis Co. T. H. Cutler, Jefferson City, ch. engr.

New Jersey—July 23, by State Hy. Comn., Trenton, constructing Big Timber Creek Bridge, and approaches on Route 47, Sect. 11, at Westville and Brooklawn, Gloucester and Camden Counties, incl. 2,389 cu.yd. foundation excav., A. L. Grover, ch. clk., adv. EN-R July 12.

N. Y., Binghamton—July 19, by C. A. Harrell, city mgr., City Hall, repairing, strengthening, rebuilding, reflooring Tompkins, Rockbottom and Washington Street Bridges over Susquehanna River and Court, Ferry and DeForest Street Bridges over Chenango River.

N. Y., New York—July 19, by Triborough Bridge Authority, 111 8th Ave., cables and suspenders of Triborough Bridge, connecting Manhattan, Bronx and Queens Boros, Contr. 18, P. Loeser, dir.

Ont., Welland—See "Contracts Awarded."

CONTRACTS AWARDED

Ark., Index—C. Bryant, Sr., pres. of Bd., repairing piers 3 and 4 of bridge over Little River, here, 12 mi. north of Texarkana, for Red River Bridge Dist., State Natl. Bank Bldg., Texarkana, to Kansas City Bridge Co., 7th St. and Kaw River, Kansas City, Mo., $47,240. Est. $30,000. **P.W.A.** Bids June 20.

Colorado—State Hy. Dpt., Denver, constructing 6 bridges hy. northwest of Rocky Ford on State Hy. 71, N.R.S. 381, Div. 1, Otero Co., to M. E. Carlson, 4483 Newton St., Denver. Bids June 27, awarded June 30. Noted June 21.

Illinois—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, steel superstructure bridge over Chicago Sanitary Ship & Drainage Canal and Illinois & Michigan R.R. and erecting steel superstructure bridge over Calumet Sag Channel and feeder ditch, both north of Lemont, Cook Co., to Strobel Constr. Co., 53 West Jackson Blvd., $69,766 and $52,892 respectively••• 3 bridges Fulton Co., to General Paving Co., Champaign, $27,988•••bridge over Des Plaines River and culvert over slough south of river, DuPage Co., to Bates & Rogers, 111 West Washington St., Chicago, $83,411. Grand total $234,057. Last job only P.W.A. Bids Mar. 13 and June 26. Noted Mar. 8 and June 21.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, Calumet Sag Channel and Feeder Ditch culvert north of Lemont, to Van Etten Bros., 111024 South Michigan Ave., $28,752•••bridge over Chicago Sanitary Ship & Drainage Canal and I & M Canal Bridge, north of Lemont, Cook Co., to T. McQueen, 1313 Forest Ave., Chicago, $57,956•••installing, erecting 4,244,660 lb. structural steel for above bridges, to Stroebel Constr. Co., 53 West Jackson Blvd., Chicago, $122,668. Grand total $209,376. Bids June 26. Awarded July 3. Noted June 21.

Ill., Chicago — Union Stockyards & Transit Co., Exchange Bldg., general contract for No. 3 overhead cattle run, 800 ft. long, 10 ft. wide, to Exchange Ave., U. S. Yards, to G. C. Poirot Constr. Co., 2001 West Pershing Rd. Est. $25,000. Awarded June 30.

Indiana—State Hy. Comn., Indianapolis, 2 bridges in Owen Co., to Mustard-Curry Building Corp., Bloomington, $24,925 est. $28,708; 2 bridges in Vermillion Co., to J. Voto, Clinton, $14,749 est. $18,768. **P.W.A.** Bids June 12.

Iowa—State Hy. Comn., Ames, 28 concrete culverts in Henry, Lee and Van Buren Counties, to C. H. Kearns, Fairfield, $4,717•••25 concrete box culverts on same road, to A. R. Coffeen, Decorah, $15,813•••bridge on same road, to Lundgren-Reis Co., 125 College St., Des Moines, $9,597•••8 pipe culverts, Jasper Co., to Schroyer & Stoops, Baxter and Ames, $12,507 •••bridges in Montgomery Co., to Wickham Bridge & Pipe Co., Council Bluffs, $8,667••• Scott Co., to W. D. Phelan, Davenport, $11,119 •••Winneshiek Co., to C. B. Taylor, Decorah, $41,600. Grand total $104,020. **P.W.A.** Bids June 19. Noted June 14.

Ia., Sioux City—City, constructing bridge, to Klinger Constr. Co., Inc., Sioux City, $29,292. Est. $29,500. **P.W.A.**

Maine—State Hy. Comn., Augusta, substructure for bridge over West Branch of Penobscot River, at Medway, involving 950 cu.yd. concrete, 53,500 ft. B.M. timber, 9,000 cu.yd. stone fill, to E. C. Snodgrass, Augusta, $33,-739•••superstructure, involving 371,000 lb. structural steel, to Lackawanna Steel Constr. Corp., Box 951, Buffalo, N. Y., $19,553. Noted June 21.

Maryland — State Roads Comn., Baltimore, double span concrete girder bridge over Little Gunpowder Falls on Phila. Rd. relocation, Contr. B-318-3-48, H-184-2-49, Baltimore and Harford Counties, to P. Reddington & Sons, 2 East Lexington St., Baltimore, $44,035. **P.W.A.** Bids May 15. Noted May 10.

Maryland — State Roads Comn., Baltimore, bridge consisting of one 15 ft. timber approach and single leaf bascule spans, etc. over Knapps Narrows connecting Tilghman Island with mainland, Contr. T-64-1-211, Talbott Co., and two 40 ft. spans concrete girder bridge, over Northwest Branch on Queen Chapel Rd., Contr. P. 181-1-311, Prince George Co., to Forbes Murphy Co., 326 St. Paul St., Baltimore, $40,-851 and $30,690 respectively. **P.W.A.** Bids June 26. Noted June 21.

Michigan—State Hy. Dpt., Lansing, N.R.M. B1 of 17-11-2C-1, Chippewa Co., consisting of one 240 ft. 2 hinged steel arch span, 2 gravity type abutments, to Fry & Kain, Inc., and R. Hudson, Lansing, $159,486•••N.R.S. B1 of 72-4-5, Contr. 1, Roscommon Co., one 50 ft. steel deck girder span, etc., to Willits & Schwernsberg, Bay City, $14,486•••N.R.S. B1 of 8-5-7, Contr. 1, Barry Co., having two 60 ft. steel deck girder type spans, etc., to E. C. Nolan & Son, Detroit, $30,525•••N.R.S. B1 of 6-5-5, Contr. 1, Arenac Co., two 60 ft. steel deck girder type spans, etc., to L. W. Lamb, Jackson, $32,933•••N.R.H.X1 of 21-11-12C-1, Delta Co., grade separation with Soo Line R.R., having three 36 ft. steel deck girder type spans, etc., to W. Toebe & Co., Shingleton, $20,512. Grand total $257,942. **P.W.A.** Bids June 22. Noted June 28.

New Hampshire—Warren Bros. Roads Co., general contractors, 38 Memorial Dr., Cambridge, Mass., construction and erection of draw span for bridge over Bellamy River, Dover, to American Bridge Co., 1413 Statler Bldg., Boston, Mass.; borings, to Gow Co., Inc., 31 St. James Ave., Boston, Mass., for State of New Hampshire Toll Bridge Comn., State House, Concord. Noted May 31, under "Contracts Awarded."

N. Y., Allegheny—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., overhead type grade crossing eliminating, to F. W. Smith & Co., 1836 Euclid Ave., Cleveland, O. Est. about $100,000. Awarded June 29. Noted May 10.

Ohio—O. W. Merrell, dir. Hys., Columbus, constructing three 40 ft. span, concrete beam bridge, concrete paved approaches over Bean Creek, on Sects. "F" and "Q" Toledo-Angola Rd., Fulton Co., to Frank Herge, Inc., Malinta, $37,322. Bids June 23.

Ohio—O. W. Merrell, dir. Hys., Columbus, creosoted timber bridge, London-Circleville Rd., Madison Co., to Brookville Bridge Co., Brookville, $5,833•••bridge on Chillicothe-Athens Rd., Ross Co., to Goodwin & Smith, Mt. Vernon, Box 174, $9,393•••bridge on Warren-Sharon Rd., Trumbull Co., to E. F. Clark, Mesopotamia, $8,811. Grand total $24,037. Bids June 22. Noted June 14.

Oregon—State Hy. Comn., Portland, constructing undercrossing Southern Pacific Ry. by Pacific Hy., Jackson Co., to Hoffman Constr. Co., Portland, $39,692. Bids July 2.

Pennsylvania—At office S. S. Lewis, secy. Hys., Harrisburg, 461 ft. pony truss bridge and rein.-con. pavement, R-508, Clymer Boro, Indiana Co., to M. Bennett & Sons, 404-4-8 Savings & Trust Bldg., Indiana, $50,367. Bids June 15. Noted June 7 under "Streets and Roads."

Ont., Welland—Stamford Twp., 77 ft. rein.-con. bridge, 44 ft. wide over Michigan Central Ry. tracks, day labor as relief work. Est. $175,000. M. F. Kerr, Ferry St., twp. engr., will be in charge.

Alaska, Juneau—Alaska Road Comn., Juneau, constructing trestle approaches, to Warrack

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†*Federal Government.*

Bridges, etc. (Continued)

Constr. Co., Juneau, $46,410. Bids June 18. Noted May 31.

STREETS AND ROADS

BIDS ASKED

Idaho—Dpt. P. Wks., Boise, rejected bids June 22, surfacing 17 mi. Sawtooth Park Hy., Bellevue-Ketchum Sect., and hauling crushed rock for same. Will readvertise. Noted June 21.

Illinois—July 24, by Dpt. P. Wks. & Buildings, Div. Hys., Springfield, improving 0.35 mi. Hillsboro-Springfield Rd., NRHM 98, Route 16, Sect. 21 X NRHM, Montgomery Co.: 0.29 mi. approaches to C.R.I. & P. R.R. subway, Oak Forest, NRH 141, Route 50, Sect. 101 S NRH, 0.33 mi. approaches M. St. P. and S.S. R.R., Orchard Pl., Project NRS 251, Route 63, WS-NRS; 1.06 mi. 71st St., near Willow Springs NRS 336, SA 206, 0102 NRS-1, all foregoing Cook Co.: 1 mi. 71st St., NRS2 same road; 0.89 mi. South Beloit St., NRS 354, SA 21, 38 Winnebago Co. E. Lieberman, ch. hy. engr.

Ill., Lewistown—July 17, by Dpt. P. Wks. & Buildings, Div. Hys., traffic bound surfacing 1.4006 mi. Sect. 5-M.F.T.; 5.102 mi Sect. 13-M.F.T.; and concrete guttering, rein.-con. box culvert on Sect. X2-15d, all Fulton Co. G. H. Baker, engr. co. roads and city streets.

Indiana—July 17, by J. D. Adams, chn. State Hy. Comn., Indianapolis, bituminous mulch paving 7.62 mi. road from St. Joe to Butler, R-926; 7.59 mi. Butler to Steuben Co. line Rd., R-927, both DeKalb Co.: 6.81 mi. road from end of concrete paving north of Akron to Silver Lake, R-928, Kosciusko Co.; 5.85 mi. Brazil to Carbon Rd., R-929, Clay Co.; 15.85 mi. road from Meron north to Vigo Co. line Rd., R-930, Sullivan Co.; 2.8 mi. Depauw to point 1 mi. west of Ramsey, R-931, Harrison Co.: 7.37 mi. Feeder Rd. S.R. 67 to Henry Co. line R-934, Madison Co.; grading, structures and stone surfacing 6.804 mi. S.R. 203, north of Marysville, R-932, 383-A, Clark and Scott Counties; 0.207 mi. at Randolph-Jay Co. line Rd., R-933, 389-A, Randolph and Jay Counties; 0.163 mi. S.R. 1, Route 389, Jay Co.: 0.045 mi. Water St., Project 130-B1, Delaware Co.; 0.205 mi. north of Dunkirk, 393-A, Jay and Blackford Counties.

Louisiana—July 24, by State Hy. Comn., Baton Rouge, grading, surfacing 0.198 mi. Route 124, between Bains and Angola, N.R.S. 240, Project 528-E, West Feliciana Parish, involving 3,382 cu.yd. roadway and 850 cu.yd. drainage excav.

Missouri—July 20, by State Hy. Dpt., Jefferson City, grading 3.163 mi. Route SH, Sect. 1, Route 71-Agency Rd., Buchanan Co.; 2.625 mi. Route SK, Sect. 5, Gilman-Gallatin Rd., Daviess Co.: 4.256 mi. Route SJ, Sect. 2, Rulo-Forest City Rd., Holt Co.; 4.564 mi. Route SJ, Sect. 3 same road; 4.165 mi. Sect. 4 same road; 1.008 mi. Route SF, Sect. 1, St. Catherine Rd. W., Linn Co.; 1.130 mi. Route SP, Sect. 1, Center Rd. S., Rails Co.; 4.825 mi. Route SE, Sect. 2, Warsaw-Fairfield Rd., Benton Co.; 3.206 mi. Route SA, Sect. 2, Bozard Rd. W.; 1.969 mi. Route SJ, Sect. 1, Route 65-Hale Rd., both Carroll Co.; 4.545 mi. Route SC, Sect. 1A, Harrisonville Rd. E.; 4.545 mi. Sect. 2A same road, 4.112 mi. Sect. 3A same road; 1.875 mi. Route SK, Sect. A1, East Lynne-Route C Rd.; 2.606 mi. Route SM, Sect. 1A, Gunn City-Route C Rd., all foregoing Cass Co.; 4.204 mi. Route SM, Sect. 1, Wilton-Ashland Rd., Boone Co.; 6.414 mi. Route SD, Sects. 3 and 4, Farmington Rd. N.; 2.529 mi. Route SN, Sect. 2A, Route W-Bismark Rd., both St. Francois Co.; 4.914 mi. Route SC, Sect. 1, Route 32-Northwest Rd., St. Genevieve Co.; 0.795 mi. Route 61, Sect. 71A, St. Charles-Floristell Rd., St. Charles Co.; 0.726 mi. Route SD, Sect. 1, Link Rd.-Route 77 Rd., 0.804 mi. Fenton-Jefferson Co. Rd., Route SJ, Sect. 3, both St. Louis Co.; 3.333 mi. Route SC, Sect. 1, Route 66-Route 38, Lawrence Co.; 5.718 mi. Route SC, Sects. 1A and 2A, Lowry City-Iconium Rd., St. Clair Co.; 8.797 mi. Route SA, Sects. 2A and 3A, Route 54-Bronaugh Rd., Vernon Co.; 3.39 mi. Route SK, Sect. 1A, Route 61-Netherland Rd., Pemiscot Co.; 11.384 mi. Route SN, Sects. 1A, 2A and 3A, Meadvile Rd. N., Linn Co.; 2.956 mi. Route 17, Sect. 1A, Route 54-Tuscumbia Rd., Cole Co.; 9.652 mi. Route 17, Route 54-Tuscumbia Rd., 0.569 mi. Route 52, Sect. 49A, Thru Tuscumbia, both Miller Co.; 5.26 mi. Route SB, Springfield South, Greene Co. T. H. Cutler, ch. engr.

Mo., Kirkwood—See "Contracts Awarded."

New Hampshire — July 19, by State Hy. Comn., Concord, rein.-con. paving 2.1 mi. State Hy.-Trunk Line Rd., Merrimack. To exceed $60,000. F. E. Everett, Patriot Bldg., Concord, state hy. comr.

New Mexico—July 10, by G. D. Macy, engr., State Hy. Dpt., Santa Fe, oil processing 14.032 mi. N.M.F.L.H.P. 2-A and 2-B, Valencia Co., $93,000; grading, draining, concrete curbing, guttering and paving 0.872 mi. NRM 133 and 168-B Silver City, $67,366; base course surfacing 6.78 mi. NRS 201-B and 203-C, San Juan Co., $7,875; single penetration asphalt surfacing 20.5 mi. FAP 29, Eddy Co., $30,000; 26.2 mi. FAP 75, McKinley Co., $40,000; 22.9 mi. FAP 23, 97-A, C and D, De Baca Co., $30,000; 19 mi. State Project 812, Lea Co., $30,000.

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North Dakota—July 20, by State Hy. Comn., Bismarck, oil mix paving 1.471 mi., road in Beulah and Hazen, NRM 235 G and NRM 235 B, Mercer Co.; 1.624 mi. in Bowbells and Kenmare, NRM 258 F and NRM 181 and NRM 288, Burke and Ward Counties; 1.77 mi. in New England and Mott, NRM 220A, NRM 37 E, and 105 and 363G, Hettinger Co.; landscaping 0.539 mi. road in Valley City east, NRH 12J, Barnes Co.; grading 15.118 mi. Antler South, NRS 448, 137,076 cu.yd. earth and 2,850 cu.yd. rock excav.; 5.215 mi. west of Overly, NRS 454, 57,303 cu.yd. earth and 125 cu.yd. rock excav., both Bottineau Co.; 6.951 mi. road west of Selz, NRS 480 and NRS 517, 78,326 cu.yd. earth and 525 cu.yd. rock excav.; 6.074 mi. east of Orrin, NRS 479, 75,782 cu.yd. earth and 300 cu.yd. rock excav., both Pierce Co.; 10.204 mi. roads south of Ross, NRS 476, incl. 143,780 cu.yd. earth and 2,150 cu.yd. rock excav.; 9.958 mi. road north of Plaza, NRS 475, 139,750 cu.yd. earth and 1,400 cu.yd. rock excav.; oiling 2,322 mi. in Parshall, Van Hook and Sanish, NRM 271A, NRM 284 and NRM 301 C, all foregoing Mountrail Co.; grading, structures 5,998 mi. Carrington Rd. East, NRH 2, Foster Co., 66,093 cu.yd. earth and 300 cu.yd. rock excav.; 7.183 mi. south of Glen Ullin, NRH 402B, Grant Co., 100,893 cu.yd. earth and 1,225 cu.yd. rock excav.; 9.448 mi. Osnabrock North and South, NRS 461, Cavalier Co., 42,210 cu.yd. earth and 600 cu.yd. rock excav.; oiling 1.171 mi. in Lisbon, NRM 129-AB and NRM 192, Ransom Co.; 0.868 mi. in Hankinson, NRM 287B, Richland Co.; 0.704 mi. in Granville, NRM 274 B, McHenry Co.; 0.617 mi. in Carrington, NRM 151, Foster Co.; 1.208 mi. Vando, NRM 130 and NRM 311B, Towner Co.; 1.684 mi. in Cogswell and Forman, NRM 229 and NRM 15D, Sargent Co. F. A. Voegel, hy. comr.

Tennessee—July 20, by State Hy. Dpt. & P. Wks., Nashville, grading, drainage, paving 0.335 mi. section of East Main St. on Hy. 1, N.R.M. 70-B, Haywood Co.; 0.518 mi. South Maney Ave. on State Hy. 2, Murfreesboro, N.R.M. 208-B, Rutherford Co.; 0.656 mi. section of North 1st St., State Hy. 11, Nashville, N.R.M. 255-E, Davidson Co.; grading, drainage 2.765 mi. Hy. Route 66, N.R.S. 409-A, Hawkins Co.; grading, drainage, surfacing 4.024 mi. hy. N.R.S. 410-A, Sumner Co.; grading, draining 5.624 mi. Section of Route 82, N.R.S. 411-A, Bedford Co.

†**Tex., Fort Sam Houston**—Con. Q.M., taking bids hard paving and improving roads in Quadrangle area. $80,000.

West Virginia—July 17, by State Rd. Comn., Charleston, stone base and surface treating 1.8 mi. Hambleton-Hendricks Rd., State Project 333, Tucker Co.; surface treating 13 mi. Ravencliff-Glen Rogers Rd., State Project 5017, Raleigh Co.; bituminous concrete or retread paving 5.86 mi. Mason County-Woods Rd., State Project 3326, Putnam Co.; 7.13 mi. Leon-Robertsburg Rd., State Project 3352, Mason Co.; Bridge 1320, NRM 203-C and NRH 203-D, Ohio Co.; grading, draining 4.2 mi. Ringold-Gum Spring School Rd. P.W.A. project 811-3477, Monongalia Co. E. F. Dickson, secy.

Wis., Green Bay—July 17, by State Hy. and Calumet Co. Hy. Comns., Green Bay, concrete surfacing 47,078 sq.yd. Hilbert-Brillian Rd., S.T.H. 114, S.A.P. 3511, incl. 84,174 cu.yd. earth, borrow, marsh and channel excav., 24 cu.yd. solid rock excav.

Ont., Port Arthur—City, bids during July about 6.67 mi. black base and asphalt paving 27 streets. J. Antonisen, city engr.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, concrete widening 11.15 mi. Phoenix-Prescott Hy., to Phoenix-Tempe Stone Co., P. O. Box 1645, Phoenix, $29,393***paving, grading railroad underpass, to N. G. Hill & Co. and H. L. Royden, Phoenix, $74,425. **P.W.A.** Bids June 20.

California—At office C. H. Purcell, state hy. engr., P. Wks. Bldg., bituminous surfacing 3.5 mi. hy. between point ¼ mi. east of Hilton and Floriston, Nevada Co., to L. G. Kipp, 2516 7th Ave., Sacramento, $15,769***grading, asphaltic concrete paving 5.5 mi. hy. between Maxwell and Delevan, Colusa Co., to Hanrahan Co., Hobart Bldg., San Francisco, $146,980*** cutback asphaltic road oil and fuel oil treating 28.7 mi. hy. between Rio Bravo and point 0.5 mi. south of Shafter, etc., Kern Co., to Granite Constr. Co., Bin 9, Watsonville, $26,655. Grand total $189,404. Bids June 20, awarded June 23 and 25.

Calif., Riverside—Street improvement, "S" turn, 7th to 8th Sts., and resurfacing part of Magnolia Ave., involving 3,800 cu.yd. excav., 8,250 cu.yd. subgrade preparation, 130 cu.yd. Class A portland cement, curbs, gutters, walks, etc., to B. G. Carroll, 4396 Maryland St., San Diego, $25,071.

Connecticut — State Hy. Comn., J. A. MacDonald, comrs., to L. Suzio Constr. Co., Meriden, bituminous macadam paving 41,790 ft. Congamond Lake Rd., Route 190, Docket 5428, Suffield, $243,906; 18,624 ft. North Grosvenordale-Quinebaug Rd., Docket 6513, Thompson, $147,274***to Clark-Barone Co., 595 Legion Ave., New Haven, installing 580 ft. rein.-con. pipe and other drainage work, on C. I. Hinkle property, Bethany, $989; rail, 124 ft. Milford Cut-off, West Clark St., Milford, $2,128; rolled bank run gravel paving 7,429 ft. Great Hill Rd., Seymour, $16,483***to Frank Arrizoni & Sons Co., Middletown, 6,850 ft. Roast Meat Hill, Parker Hill and Pond Meadow Rds., Killingworth, $14,373***to S-K Constr. Co., Lebanon, rolled bank run gravel paving 13,6[illegible] ft. Water St., Lisbon, Miller and Brooklyn Rds., Canterbury, $19,874; 8,700 ft. Jones St., Hebron, $14,071***to J. H. Adams, Washington Depot, 3,650 ft. Northfield Rd. and bituminous gutters 1,233 ft. East Litchfield Rd., Litchfield, $8,853***to A. Jarvis, Manchester, [illegible] gravel surfacing 6,000 ft. North Eagleville Rd., Mansfield, $7,227***to A. J. Kovacs, Bridgeport, rolled bank run gravel paving 6,6[illegible] ft. Portland Ave., Aspetuck Valley and Lime Kiln Rds. and loose gravel paving 2,800 ft. Prospects Ridge Rd., Redding, $17,521***to Patterson & Rossi, Torrington, rolled bank run gravel paving 4,250 ft. 2 sections of Town Aid Rd. and replanking 3 bridges, constructing 20 ft. span concrete slab bridge and 16 ft. span multiple arch culvert and installing twin 48 in. and 60 in. B.C.C.M. pipe culverts, Roxbury, $18,801***to J. Pasone, 73 Steuben St., Bridgeport, waterbound macadam paving 800 ft. Huntington Turnpike and rolled bank run gravel surfacing 6,994 ft. Reservoir and Whitney Aves. and North St. and Grace Church Rd., Trumbull, $15,175. Grand total $525,875. Subject to **P.W.A.** Bids June 8. Noted June 14.

Connecticut — J. A. Macdonald, state hy. comrs., Hartford, to P. Mitchell, Inc., Hartford Bldg., Greenwich, grading, drainage 17,780 ft. Greenwich, $583,086***to D. V. Frione & Co., 36 Foxon St., New Haven, 15,740 ft. Trumbull, $239,177; rein.-con. paving 7,585 ft. New Haven, $53,480; 2 in. bituminous macadam on 4 in. broken stone paving 1,643 ft. Winchester Ave., New Haven, $9,757***to New Haven Road Constr. Co., Inc., 1817 Dixwell Ave., New Haven, sheet asphalt paving 2,434 ft. Ferry St. and 5,300 ft. Winchester Ave., New Haven, $57,977, foregoing P.W.A. projects ***to Lane Constr. Corp., 35 Colony St., Meriden, rolled bank run graveling 8,026 ft. Andover, $16,460; 9,825 ft. Somers, $11,088; trap rock waterbound macadam paving 7,363 ft. East Granby, $14,415***to Medbury & Trowbridge, Putnam, rolled bank run gravel paving 6,350 ft. Thompson, $9,025***to Julius Varvello, Inc., 575 Columbus Ave., New Haven, 7,655 ft. Marlboro, $16,211***to Innis Bros.-Thomaston, 9,500 ft. New Hartford, $10,353 ***to Bloomfield Constr. Co., Bloomfield, 8030 ft. Canton, $7,995***to F. T. Miller, Norwich, loose gravel surfacing 11,273 ft. Brooklyn, $19,570***to N. Benvenuti, 6 Elm St., New London, 16,297 ft. Eastford, $24,075***to Highway Constr. Co., 73 Steuben St., Bridgeport, 11,306 ft. Colebrook, $17,642; crushed gravel or native stone macadam paving 5,875 ft. Wilton, $10,514***to C. W. Blakeslee & Son, 58 Waverly St., New Haven, 50 ft. clear span concrete encased I-beam bridge and trap rock waterbound macadam paving 390 ft. Groton Long Point Rd., Groton, $48,691, foregoing Town Aid projects. Grand total $1,126,041. Bids June 4. **P.W.A.** Noted May 24 and 31.

Conn., Hartford—City, bituminous macadam paving South Meadows Rd. from Aviation Rd. to disposal plant, to Arborio Road Contr. Co., Wilson, $28,520. Est. exceeds $25,000. Awarded June 26. R. N. Clark, Municipal Bldg., Hartford, engr.

D. C., Wash.—District Comrs., District Bldg., roadwork, to McGuire & Rolfe, foot 30th St. Ave. N.W., $241,874***roadwork, to Corson & Gruman, 33rd and K Sts. N.W., $131,178*** roadwork, to W. F. Brenzier Co., 1501 South Capitol St., $15,199. Grand total $388,251.

D. C., Wash.—District Comrs., District Bldg., curbing, guttering, surfacing streets, to McGuire & Rolfe, 1st and O Sts., $116,143*** sidewalks, to Wilmoth Paving Co., Tower Bldg., $62,530***steel bridge at Minnesota Ave., over Watts Branch, to P. D'Adamo Constr. Co., Old Towner Natl. Bank Bldg., Baltimore, Md., $12,418. Grand total $191,091.

Illinois—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, grading 4.74 mi. from Maples Mill south and westerly and 2.77 mi. from Route 95 east of Lewistown south, Fulton Co., to E. J. Eiff Co., Quincy, $44,735 and $84,965 respectively***0.68 mi. in Tazewell Co., to Fransan Bros., 7537 South Racine Ave., Chicago, $27,902***5.04 mi. Fulton Co., to Birt Bros. Constr. Co., Decatur, $71,423. Grand total $229,025. Bids June 26. Noted June 21.

Indiana—State Hy. Dpt., Indianapolis, concrete paving 29,904 sq.yd. road in Dearborn Co., to Serodino Constr. Co., Cincinnati, O., $98,053. Est. $123,772. **P.W.A.** Bids May 29. Noted May 24.

Indiana—State Hy. Comn., Indianapolis, concrete paving 17,651 sq.yd. road in Franklin Co., to L. H. McAfee, 901 Wells St., Fort Wayne, $58,016. Est. $66,520. **P.W.A.** Bids June 12. Noted June 7.

Indiana—State Hy. Comn., Indianapolis, concrete paving 8,405 sq.yd. road in Knox Co., to Lenahans & Konan, Inc., Vincennes, $40,007. Est. $44,938. **P.W.A.** Bids May 29. Noted May 24.

Indiana—State Hy. Comn., Indianapolis, grading, concrete paving 26,611 sq.yd. road in White and Carroll Counties, to McCoun Constr. Co., Noblesville, $61,006. Est. $66,179. **P.W.A.** Bids June 12. Noted June 6.

Iowa—State Hy. Comn., Ames, paving 6.403 mi. Jasper Co., to Carlson Constr. Co., Marshalltown, $158,308***0.269 mi. Scott Co., to W. D. Phelan & Co., Davenport, $8,742***0.199 mi. Winneshiek Co., to F. Carlson, Decorah, $12,273 ***grading 12.073 mi. Henry, Lee and Van Buren Counties, to Bursh Constr. Co., Ottumwa, $32,354***bituminous surfacing 2.3 mi. Audubon and Shelby Counties, to Kelley Constr

†*Federal Government*

Streets and Roads (Continued)

Co., Des Moines, $3,970. Grand total $125,656. **P.W.A.** Bids June 19 and July 2. Noted June 14.

Kentucky—State Hy. Comn., Frankfort, grading, draining 7.835 mi, Round Hill-Caneyville Rd., incl. spur to Mt. Pleasant School, to Ruth Bros., Frankfort, $64,679. Bids May 24. Noted May 3.

Md., Baltimore—Bd. awards concrete paving 10,750 sq.yd. streets, Contr. 644, to Arundel Constr. Co., 910 Trinity St., Baltimore, $27,-941. Bids June 20. Noted June 14.

Maryland—State Roads Comn., Baltimore, furnishing, delivering and laying bituminous surface course, Spec. "C" on 1.85 mi, Contr. B-274-2-48 Federal Aid Project N.R.H. 286, Baltimore Co., to P. Flanigan & Sons, Harford Ave., and Baltimore & Ohio R.R., Baltimore, $22,422; 284 ft. treated timber bulkhead along Paint Branch at College Park, Contr. P-289-1-311, Prince George Co., to Brundage & Crandall Co., Sudleysville, $4,960. **P.W.A.** Bids June 26. Noted June 21.

Maryland—State Roads Comn., Baltimore, grading, drainage for dual hy. along 3.99 mi. Philadelphia Rd. relocation from Cowenton to Little Gunpowder Falls, Contr. B-318-48, Baltimore Co., to H. T. Campbell & Sons Co., Towson, $138,897. **P.W.A.** Bids May 15. Noted May 10.

Maryland — State Roads Comn., Baltimore, grading, drainage for dual hy. along 3.31 mi. Philadelphia Road Contr. B-317-48, Federal Aid Project, R.H. 335, Baltimore Co., to H. T. Campbell & Sons Co., Towson, $94,142. **P.W.A.** Noted May 3. Bids May 8.

Massachusetts—Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, bituminous macadam resurfacing and widening 20,300 ft. P.W.A. Project R-38, Docket 5516, Hatfield and Northampton, to Kelleher Corp., Turners Falls, $137,650. **P.W.A.** Bids June 26, awarded June 29. Noted June 21.

Massachusetts — Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, rein.-con. paving 4,782 ft. and bituminous macadam resurfacing and widening 700 ft. Route 114, P.W.A. Project R-12, Docket 1943, Lawrence and North Andover, to Jas. E. Watkins Co., Inc., 41 Powow St., Amesbury, $42,184. **P.W.A.** Bids June 19, awarded June 27.

Massachusetts—Town of Falmouth, F. T. Lawrence, chn. Bd. Selectmen, at office Dpt. P. Wks., 100 Nashua St., Boston, gravel and tar mixed in place surfacing 9,520 ft. hy. Falmouth, to F. V. Lawrence, Woods Hole, $13,104 ***Town of Great Barrington, E. R. Williams, chn. Bd. Selectmen, at Dpt. P. Wks. office, bituminous macadam paving 2,900 ft. hy. Great Barrington, and city of North Adams, A. J. Pratt, mayor at office Dpt. P. Wks., gravel and tar mixed in place surfacing 3,500 ft. hy. North Adams, to C. B. Lindholm, 24 North St., Pittsfield, $18,492 and $12,337 respectively. Grand total $43,933. Bids June 26.

Mass., Boston—City, Transit Dpt., T. F. Sullivan, comr., 1 Beacon St., Boston, passageway, bituminous macadam paving and improvements, Haymarket Sq., in connection with entrance to East Boston Traffic Tunnel, to Baker-Matz & Co., 25 Zamora St., Jamaica Plain, $46,787. Bids June 25, awarded June 26. Noted June 21.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, bitulithic paving Ashmont St. from Neponset Ave., to Carruth St., to Keystone Eng. & Constr. Co., 43 Charter St., $56,833. **P.W.A.** Bids June 11, awarded June 29. Noted June 7.

†Mass., Chelsea—Superintendent Lighthouses, 37 Marginal St., grading, rein.-con. paving in yard of Lighthouse Depot on Marginal St., to D. A. Rossano, 579 Bennington St., East Boston, $4,210 plus $1.81 per sq.yd. for additional paving. Bids May 29.

†Mass., Rutland Heights—Vet. Bu., Arlington, Bldg., Wash., D. C., bituminous macadam paving roads at U. S. Veterans Facility, to J. J. Callahan, 74 Park St., Dorchester, $15,000. Bids June 28. Noted June 14.

Michigan—State Hy. Comn., Lansing, M. D. Van Wagoner, state hy. comr., Lansing, removing existing asphalt surface and bituminous concrete resurfacing 1.031 mi. hy. and removing 24 ft. brick surface and concrete repaving central 40 ft. with sheet asphalt on 0.41 mi. N.R.H.M.-13-35-C-1, Calhoun Co., to W. J. Lang Constr Co., Kalamazoo, $88,578***sheet asphalt resurfacing existing concrete brick pavement and brick surface 1.027 mi. N.R.M. 82-42, Contr. 1, Wayne Co., to Cleveland Trinidad Paving Co., Western Reserve Bldg., Cleveland, O., $81,396. **P.W.A.** Bids June 22. Noted June 28.

Mo., Kirkwood—City, grading Wilson and Fillmore Aves., Telford macadam paving West Big Bend Rd., Nirk, Quan, Grand and Cleveland Aves., by local labor. $120,000 upwards.

Nebraska—State Hy. Dpt., Lincoln, grading 2.3 mi. Bassett-Newport Rd., NRH 168-B, Rock Co., to W. A. Biba Eng. Co., Geneva, $11,716 ***culverts and bridge on same road, to Fullen Constr. Co., Gering, $2,893 and $1,953 respectively***oiled sand surfacing 5.1 mi., North Platte-Tryon Rd., NRH-233-C, McPherson Co., to E. D. Reed, Clay Center, Kan., $23,142*** grading 2.1 mi. Cambridge-Holbrook Rd., NRH 254-A and B, Furnas Co. and 1.6 mi. Big Springs-Northeast Rd., Project 260-K, Deuel Co., to J. E. Tift, Grand Island, $12,817 and $7,754 respectively***bridges on Cambridge-Holbrook Rd., Furnas Co., to Jensen Constr. Co., Kimballton, Ia., $10,715***culverts and bridge, Deuel Co., to Diamond Eng. Co., Grand Island, $739 and $5,777 respectively***paving 6.1 mi. Waterbury West Rd., NRH-270-A and 271 B, Dixon Co., to Booth & Olson, Inc., Sioux City, Ia., $226,217***sand graveling 3 mi, Crofton Rd. N., Project 294-K, Knox Co., to Inland Constr. Co., 3867 Leavenworth St., Omaha, $2,304*** bridges in Douglas Co., to G. W. Condon Co., 219 Grain Exch. Bldg., Omaha, $44,932. Grand total $350,959. **P.W.A.** Bids June 28. Noted June 14.

N. J., Franklin Park—Somerset Co. (Somerville), concrete paving Sect. 1, Franklin Park-Middlebush Rd., to F. Mobus, Inc., North Plainfield, $22,760. Bids June 29.

New Mexico—State Hy. Comn., Santa Fe, improving NRH-4, to Dudley Stone Products Co., Inc., 2101 San Diego St., El Paso, Tex., $85,955 ***NRH-165-C, to Capitol Constr. Co., Sante Fe, and Dudley Stone Products., 2101 San Diego St., El Paso, Tex., $16,706***NRS 209-A, to Brown Bros., Albuquerque, $22,237. Grand total $74,898. **P.W.A.** Bids June 6.

Ohio—O. W. Merrell, dir. Hys., Columbus, cold laid asphaltic concrete paving 1.407 mi. Gahanna-Southern Rd., Franklin Co., to Price Constr. Co., Huntington, W. Va., $65,976*** grading, draining, constructing storm sewers, rein.-con. widening, brick paving, incl. furnishing, delivering brick, 0.679 mi. Sect. "Dayton" Dayton-Springfield Rd., Montgomery Co., to Price Bros. Co., Box 825, Dayton, $60,623. **P.W.A.** Noted June 14.

Ohio—O. W. Merrell, dir. Hys., Columbus, traffic bound surface course paving mi. hy. and constructing semi-circular rein.-con. arch culvert on Hillsboro-Portsmouth Rd., Adams Co., to James Small & Co., 1740 East 12th St., Cleveland, $17,752***grading, removing old car tracks, draining and concrete paving 0.467 mi. Lima-Sandusky Rd., Hancock Co., to Dorsey Constr. Co., 1130 South Main St., Findlay, $8,290***removing present curb and resetting curb, excavating and constructing concrete base, brick paving, incl. furnishing, delivering brick, 0.303 mi. Roundhead-Mt. Corey Rd., Hardin Co., to J. Hill, Ada, $9,541*** brick paving, incl. furnishing, delivering brick, 1.205 mi. Richmond Rd., Cuyahoga Co., to Highway Constr. Co., 913 Midland Bldg., Cleveland, $120,428***1.068 mi, Oberlin-Norwalk Rd., Huron Co., to A. J. Baltes, 181 Benedick Ave., Norwalk, $76,272***0.291 mi. Cleveland-Wooster Rd., Wayne Co., to R. W. Rankin, 513 Samaritan Ave., Ashland, $24,570*** concrete paving 0.259 mi. Hicksville-Edon Rd., Williams Co., to N. A. G. Sunday and Lauder & Son, Inc., Antwerp, $1,293*** 2,823 mi. Ohio River Rd., Washington Co., to L. F. Cisler & Son, and Merry & Cisler, Marietta, $92,121***0.153 mi. Ohio River Rd., Meigs Co., to Bellefontaine Development Co., 216 West Auburn St., Bellefontaine, $7,322***0.261 mi. Celina-Van Wert Rd., Van Wert Co. to Lynn Constr. Co., Paulding, $11,364***0.386 mi. Ashland-Medina Rd., Medina Co., to Geo. S. Mellert-Weidner Co., 218 South Bway., Medina, $16,714*** 0.333 mi. Columbus-Wooster Rd., Knox Co., to George B. Herring & Son, 419 West 3rd St., Mansfield, $17,383. Grand total $433,050. **P.W.A.** Bids June 22. Noted June 14.

Ohio—O. W. Merrell, dir. Hys., Columbus, concrete widening, drainage structures, cold laid asphaltic concrete resurfacing 2.797 mi. Brown Co., to General Asphalt Paving Co. and Clark Bros. Co., Inc., 307 Kahler Bldg., Canton, $80,-085***traffic bound surface course paving 0.444 mi. Granville-Dublin Rd., and constructing concrete arch culvert, 24 ft. span, etc. over Simpson Run, Licking Co., to Price Constr. Co., Inc., 2702 3rd Ave., Huntington, W. Va., $20,403 ***adjusting catch-basins, manholes and hot mixed asphaltic concrete paving 1.048 mi. Lucas Co., to W. F. Ryan Constr. Co., 1815 North 13th St., Toledo, $25,921. Grand total $126,409. Bids June 22. Noted June 14.

O., Cleveland—City, repairing delinquent concrete and stone sidewalks, in Northerly, Southerly, Westerly and West Park Dists. for 1 year, involving 2,300 cu.yd. excav., 305,200 sq.ft. concrete sidewalks, to A. Gaudio, 1836 Wadena Ave., $53,188***1,900 cu.yd. excav., 103,750 ft. stone sidewalks, to Cleveland Quarries Co., Builders Exchange Bldg., $19,201. Bids May 17.

Pennsylvania—At office S. S. Lewis, secy. Hys., Harrisburg, rein.-con. paving 0.64 mi. hy. Whitehall Twp., C. A. Appl. 9392, to General Paving Co., 616 Muhlenberg St., Allentown, $25,191; rein.-con. paving 1.03 mi. hy. Whitehall Twp., C. A. Appl. 9470, to R. E. Newmeyer Co., 452 North New St., Bethlehem, $31,472, both projects in Lehigh Co. Bids June 15. Noted June 7.

South Carolina—State Hy. Dpt., Columbia, curbing, guttering 1.219 mi. Route 7, Project N.R.M. 310-B, Sects. 1, 2, 3 and 4, Newberry Co., to S. S. Newell & Co., Greenville, $33,235; bituminous surface widening and plain concrete and sidewalk paving 1.355 mi, Route 2, N.R.M. 146, Sects. 1, 2 and 3, Lexington Co., to Carolina Contg. Co., Columbia, $11,463. **P.W.A.** Awarded June 26.

†South Dakota—P. Rds., Custom House, Denver Colo., road mix oil surfacing 7.267 mi. NR-1 A Oil of North and South Hy., Wind Cave Natl. Park, to Inland Constr. Co., 3867 Leavenworth St., Omaha, Neb., $37,538. Bids June 12, awarded June 26.

Tex., Houston—Harris Co., c/o H. L. Washburn, aud., asphaltic concrete on brick paving, grading, drainage structures 5.5 mi. Old Liberty Rd. beginning on Hy. 35, 20 ft., to Brown & Root, Inc., 4300 Calhoun St., $122,678. Est. $123,000. **P.W.A.** Bids June 23.

Wash., Tacoma—Comrs. Pierce Co., paving 1.75 mi, Puyallup-Graham Rd., to J. Warter, Sr., 631 North Fife St., $24,982. Bids June 5.

Wisconsin—State Hy. Comn., Madison, graveling road in Shawano Co., to J. F. Bloomer, 733 West 5th St., Appleton, $12,292***grading, draining 5.89 mi. in Shawano Co., to Ryan Bros., De Pere, $48,142***3.012 mi. Vernon Co., to W. Lathers, Jr., 216 Virginia Terrace, Madison, $18,261***bituminous surfacing 16 mi. Vilas Co., to Eau Claire Sand & Gravel Co., Eau Claire, $8,369. Grand total $87,064. Bids June 14. Noted June 7.

Wisconsin—State Hy. Comn., Milwaukee, concrete surfacing 0.7 mi. Dane Co., to Koch Constr. Co., Milwaukee, $14,349; constructing road in Marathon Co., to Payne & Dolan of Wisconsin, Inc., 735 North Water St., Milwaukee, $15,470. **P.W.A.** Bids June 29.

Wis., Kiel — City, curbing, guttering, storm sewers in roads, to Simpson-Parker Co., Appleton, $26,776. Bids June 15.

†Puerto Rico—U. S. Eng., 0.62 kilometers of macadam road and 3 culverts near Lajas, to Curelio Tio, San German, Puerto Rico, $3,-889. Bids June 4.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Manteca—South San Joaquin & Oakdale Irrigation Dists. Manteca and Oakdale respectively, plan cleaning out tunnel and replacing wooden posts with steel arches and concreting between arches. $30,000.

Ill., East St. Louis—East Side Levee and Sanitary Dist., S. H. Kernan, pres., 628A Missouri Ave., soon takes bids construction diversion channel for Cahokia Creek into Mississippi River, incl. necessary bridges, etc., above here at National Stock Yards, National City. $2,-360,295. P.W.A. loan and grant allotted. E. F. Harper, ch. engr. Noted Aug. 24, 1933.

†Ill., Joliet—U. S. Eng., U. S. Post Office, Chicago, plans widening Desplaines River channel, incl. excavating earth and rock in dry and constructing retaining walls at Ruby Street Bridge. $25,000.

†Ind., Michigan City—U. S. Eng., Post Office Bldg., Chicago, Ill., plans dredging at Michigan City harbor.

†Massachusetts—U. S. Eng., Custom House, Boston, preparing estimates dredging new straight approach channel at Buzzards Bay entrance to Cape Cod Canal, 500 ft. wide.

†Minn., Red Wing—U. S. Eng., 615 Commerce Bldg., St. Paul, plans nearing completion constructing Lock and Dam 3 in Mississippi River, operating machinery and power house, etc. $20,000,000.

Neb., Ord—North Loup Hydro-Electric & Irrigation Dist., Lincoln, denied loan by P.W.A. for 4 mi. main canal with reservoir and power unit, near Sioux Creek between Ord and Taylor. $3,000,000. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs. Noted Oct. 12.

Tex., Austin—Colorado River Co., c/o A. Mallott, pres., San Antonio, plans completing Hamilton Dam project on Colorado River, 30 mi. northwest of here. $4,500,000 P.W.A. allotment approved.

Tex., Eagle Pass—Maverick Co. Water Control & Impvt. Dist. 1, c/o Dr. Van E. McGarland, pres. Bd., plans restoring portion 32 mi. canal for power and irrigation and completion of system. $2,421,875 P.W.A. allotment approved. Myers, Noyes & Forrest, Tower Petroleum Bldg., Dallas, engrs. Noted July 6, 1933.

Tex., Edinburg—Hidalgo Co. Water Impvt. Dist. 6, c/o A. L. Cramer, pres., concrete lining canals or laying concrete pipe in canals. $199,-074 P.W.A. allotment approved. A. Tamm, Harlingen, engr.

Ont., Toronto — Wellesley Twp. plans tile drainage. $25,000.

Que., Montreal—Harbor Comn. plans certain protection work between Laurier and Tarte Piers.

Que., Verdun—City Engineer preparing plans rein.-con. seawall (dyke), bathing beach and extending boardwalk. $400,000.

BIDS ASKED

Calif., Los Angeles—July 23, by Bd. Supervs. Flood Control Dist., 205 South Bway., constructing conduit on Verdugo Wash, Pacific to Kenilworth Aves., involving 5,500 cu.yd. excav., 2,700 cu.yd. backfill, 1,350 cu.yd. rein.-con., 1,775 lin.ft. fencing, 100 lin.ft. drill dowel holes, 50 ft. place tile Proposal 1 above work. Dist. to furnish cement and admixture f.o.b. Pacific Electric Siding, Glendale; Proposal 2, ditto. Dist. to furnish same f.o.b. site of work. To exceed $17,750.

†Ill., Waukegan—U. S. Eng. bids about July 15, recapping toe protection and replacing rip rap on piers and breakwater at Waukegon Harbor.

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†Federal Government.

Earthwork, etc. (Continued)

†Indiana—U. S. Eng., Post Office, Chicago, Ill., bids about July 27, dredging 350,000 cu.yd. earth excav. of Indiana Harbor Canal.

†Tex., Brazos Island—Aug. 1, by U. S. Eng., Galveston, dredging 17,490,000 cu.yd. from Brazos Island Harbor from west side long Island Station 13/250 to and including turning basin near Brownsville.

British Columbia—July 19, by Secretary Dpt. P. Wks., Ottawa, Ont., removal and renewal of portions of wharfhead superstructure, fender piles and 12x63 ft. float, boxing water pipe, 637 lin.ft. electric light standards, $15,000. K. M. Cameron, Ottawa, Ont., engr.

LOW BIDDERS

†Oregon—Bureau Reclamation, Portland, July 5, constructing Bonneville Dam power house and navigation locks, from General Constr. Co. & J. F. Shea, Henry Bldg., Portland, $3,895,-592. Est. $3,957,562. Noted June 28.

CONTRACTS AWARDED

†Alabama—U. S. Eng., P. O. Box 900, Nashville, Tenn., constructing central control system, operating machinery and electric system at Lock 3, Tennessee River, to E. A. Koememan Electric Co., $133,409. Noted June 7.

Mass., Dennis—Commonwealth of Massachusetts, F. E. Lymen, comr., 100 Nashua St., Boston, furnishing, placing 1,100 tons stone rip rap, for construction of 2 jetties at entrance of Swan Pond River, to F. B. Lawrence, Falmouth, $2,783.

†New Jersey—Superintendent Lighthouses, Staten Island, N. Y., 4,200 to 5,200 tons rip rap stone, Raritan River and Arthur Kill, to Bouker Contg. Co., 17 State St., New York, $11,760. Bids May 25.

†Pa., Phila.—Yards & Docks, Navy Dpt., Wash., D. C., dredging along Delaware River Waterfront, Spec. 7679, to American Dredging Co., 308 Chestnut St., $35,000. Bids June 20.

Ontario—Secretary Dpt. P. Wks., Ottawa, Ont., dredging 74,000 cu.yd. sand, silt and clay, Fort William, to Great Lakes Dredging Co. Ltd., Ottawa, at 37.34c. per cu.yd. total $28,-124 est. $28,000; dredging 27,000 cu.yd. silt, sewage, sand and clay, Owen Sound, to Randolph MacDonald Co. Ltd., Toronto, at 47.5c. per cu.yd. total $12,825 est. $13,000.

Ont., Byng Inlet—Secretary Dpt. P. Wks., Ottawa, Ont., dredging 87,300 cu.yd. silt and sand, to C. S. Boone Dredging & Constr. Co., Toronto, at 57c. per cu.yd. total $49,761. Est. $40,000. Noted Apr. 26.

UNCLASSIFIED

PROPOSED WORK

Calif., Redondo Beach—PIER—City Council made plans 268 ft. extension of city pier, incl. boat landing, 42 ft. traffic line and runways for fishing. $29,000 funds voted. D. L. Bundy, City Hall, engr.

Calif., Santa Rosa—RECREATION CENTER—City plans recreation center, comprising of tennis courts, handball courts, baseball diamond, football and soccer field, archery range, basketball courts in South A St., Project to be financed under $75,000 bequest made by late L. Howarth, Santa Rosa.

Kan., Great Bend—SWIMMING POOL—City rejected bids 60x180 ft. swimming pool. $36,-000. M. Hall, city engr. Noted Apr. 19.

Mich., Detroit—SUBWAY LINES—P.W.A. rejected application of City, Rapid Transit Comn., J. P. Hallihan, ch. engr., 735 Randolph St., for Federal aid in financing under N.R.A., subway lines for city, incl. 9.49 mi. double track subway under Woodward Ave from Jefferson Ave. N. and 11.11 mi. across city from Harper and Gratiot Aves. to vicinity of Ford plant on the west. Est. $87,000,000.

Mich., Lansing — AIRPORT — State Administrative Bd. authorized State Aeronautical Dept. to prepare plans, Lansing Airport, incl. paving 50 ft. wide taxi strips in front of hangars (asphalt paving); cinderized diagonal runway across field, cinderized parkways, 100x200 ft. and 100x150 ft., paving two 400 ft. asphalt starting strips, brick, concrete aprons in front of hangars and bleachers. $25,000.

Montana, U. S. A., and Alberta, Can.—PIPE LINE—Toronto Pipe Line Co., c/o British-American Oil Co., Coutts, Alberta, Can., plans 36 mi. pipe line from Cut Bank, Mont., to Coutts, Alta. To exceed $25,000. **Maturity indefinite.**

N. Y., Rochester—TANKS—Beacon Oil Co., 40 Franklin St., plans 2 storage tanks, 60,000 bbl. capacity. $30,000.

†North Carolina—TELEPHONE LINE—National Park Service, Wash., D. C., plans 6.5 mi. telephone line between Maggie and Black Camp Gap along Wykle Fork Co. Rd. on boundary of Great Smoky Mountains Natl. Park, Haywood Co. J. R. Eakin, supt. Great Smoky Mountains Natl. Park.

Tennessee—NATURAL GAS PIPE LINE—Sunbright Pipe Line Co., Sunbright, J. H. Graham, pres., filed petition with P. Utilities Comn. to extend its natural gas pipe line to Knoxville, Maryville and Jellico, Cohl and Tyre. $1,000,000.

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Investment House of Cincinnati, O., have agreed to furnish $1,000,000 for investments, options for right-of-ways have already been secured.

Ont., Whitby — DOCK — C. E. Bournan, mayor, making plans and takes bids latter part July improving docking facilities at Oshawa Harbor. $100,000.

Que., Lauzon—PIER—George T. Davis & Sons making plans constructing pier. $50,000.

Que., Verdun — BATHING BEACH — See "Earthwork, Irrigation, Drainage, Waterways."

BIDS ASKED

Ia., Readlyn—DISTRIBUTION SYSTEM—July 17, by Town, W. Meier, clk., electric light and power distribution system and 6 mi. 13,-200 volt transmission lines.

Mo., St. Louis—WADING POOLS, etc.—July 31, by City, Bd. P. Serv., City Hall, ten 31x52 ft. wading pools surrounded by 9½ ft. concrete sidewalks in various parks and playgrounds, $15,000. P.W.A. project; also altering Union Market Building, at Bway. and Delmar Blvd., incl. relocating passenger elevator, $50,000. W. C. E. Becker, city engr.

N. Y., Brooklyn—RAILROAD—July 31, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, installing tracks and contact rail for part of Rapid Transit Railroad, Route 110, Sects. 3, 4 and 5, under Fulton St. from vicinity Nostrand Ave. to vicinity Rockaway Ave.

N. Y., New York—CABLES—July 20, by F. J. H. Kracke, comr. Plant & Structures, Municipal Bldg., laying 4 submarine cables at Greenpoint Ave. and Vernon Ave. Bridges over Newtown Creek.

LOW BIDDERS

N. Y., Brooklyn—SIGNALLING EQUIPMENT—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, July 9, furnishing, installing block signalling and interlocking equipment for portion of Independent City-owned Rapid Transit Railroad from General Railway Signal Co., 230 Park Ave., New York, $2,827,500; station finish work, for Franklin, Nostrand, Kingston and Throop Ave. stations, from Meads Eng. Co., 217 West 14th St., New York, $187,120. Noted June 21.

N. Y., New York—PIER SHEDS—Dpt. Docks, Pier A, North River, July 5, constructing pier sheds on Pier 88, North River. Specs. A, B and C, from W. Kennedy Co., 216 Montague St., Brooklyn, $547,335 each; Pier 90 and Pier 92, Specs. A, B and C, from G. F. Driscoll, 550 Union St., Brooklyn, $546,334 each and $556,834 each respectively. Noted June 28.

CONTRACTS AWARDED

†Calif., Los Angeles—LAWN SPRINKLING SYSTEM—Vet. Bu., Arlington Bldg., Wash., D. C., cemetery lawn sprinkling system, to Peterson Bros., 239 Olive St., Inglewood, $23,-694.

Calif., San Francisco — ORNAMENTAL LIGHTING SYSTEM—F. Taylor, secy. P. Utilities Comn., City Hall, ornamental street lighting system in Potrero Ave., Contr. 4, involving 138 bracket lighting units, 140 pull boxes, 17,500 ft. conduit, 37,000 ft. primary cable, to Severin Electric Co., 172 Clara St., $30,876. Bids June 21, awarded June 26.

Conn., Kent — SPORTS BUILDING — Kent School, Kent, 1 story, basement, 60x110 ft., brick, stone sports building, incl. locker facilities, showers and gymnasium, to A. F. Peaslee, Inc., 15 Lewis St., Hartford. Est. $30,000. W. N. Mills, 259 West 11th St., New York, engr. Awarded June 27.

†Idaho, Boise—STEAM SYSTEM— Vet. Bu., Arlington Bldg., Wash., D. C., steam distribution system extension, to T. L. Dawson Co., 2035 Washington St., Kansas City, Mo., $24,-500. Bids June 26. Noted June 14.

Kan., Iola—SWIMMING POOL, etc.—City, contract for 75x150 ft., rein.-con., brick swimming pool and bathhouse, to Lister & Cox, Emporia, rescinded. Est. $40,000. Noted May 3.

Mass., Worcester—BATHHOUSE—City, J. C. Mahoney, mayor, brick bathhouse, incl. 200 lockers. Owner builds, FERA labor. Est. $80,-000. Indefinite when work will start. F. H. Cutting, 29 Pearl St., engr. Noted Nov. 23.

†Mich., Camp Custer—FENCE—Vet. Bu., Arlington Bldg., Wash., D. C., chain link fence and gates, to Cyclone Fence Co., Waukegan, Ill., $9,309.

Montana, U.S.A. and Alberta, Can.—PIPE LINE—Toronto Pipe Line Co., Coutts, Alberta, Can., 35 mi. 6 in. gas line from Cut Bank, Mont., to Coutts, Alta., Can., to R. C. Moore, Shelby, Mont., $100,000. Noted July 5.

N. Y., Geneva—COAL BINS—Rappelle Coal & Coke Corp., Geneva, constructing 8 timber coal and coke bins with elevating machinery, 1,000 tons capacity, to J. L. Klug, 1614 Harrison St., Utica, awarded June 29.

North Carolina—PRISON CAMPS—State Hy. & P. Wks., Raleigh, electrical work at Macom Camp and at Jackson Camp, to Mill & Marine Electric Co., Gastonia, $2,250; plumbing at Macon Co. and Jackson Co. Camps, to Hickory Plumbing & Heating Co., Hickory, $4,865. Noted Jan. 11.

O., Conneaut—MARINE DOCK—City, L. R. Naylor, construcing municipal marine dock at foot of Broad St. on Lake Erie, to American Constr. Co., Cleveland, $23,400. Est. $25,000 or more. A. L. Lamp, Conneaut, service dir.

†Okla., Fort Sill—BALLOON HANGAR—Con. Q.M., erecting balloon hangar at Post Field, to Manhattan Constr. Co., 1st Natl. Bank Bldg., Oklahoma City, $67,025. Bids June 19.

MATERIALS AND EQUIPMENT

PROPOSED WORK

FIRE ENGINES—**Modesto, Calif.**—Supervs. Stanislaus Co., will call election to form district to vote bonds to finance purchase of motor fire engines and modern fire fighting equipment to protect in excess of 1,000,000 acres of grain fields.

PUMP, etc.—**Newman, Calif.**—O. E. Brown, principal Crestimba Union High School Dist. cancelled bids to have been opened June 29 for 1 deep well turbine pump, 175 g.p.m. capacity minimum to 25,000 gal. capacity storage tank on 90 ft. tower, Proposal 1, from 30 ft. pumping level, Proposal 2, from 45 ft. pumping level, and Proposal 3 from 60 ft. pumping level, installation to include switches, pump and pipe connections, valves, etc.; steel water tower and 25,000 gal. tank on 90 ft. steel frame, incl. construction of concrete foundation, deep well turbine pumping plant, pressure tank and all accessories to make installation completely automatic, 250 g.p.m. pump, operating against total head of 150 ft. motor of full vertical hollow shaft, 1,750 r.p.m., 220 volt, 60 cycle, 3-phase, discharge pipe to be not less than 4 in, pressure tank to be 5,000 gal. capacity, alternate pump 175 g.p.m. on 150 ft. head and maintain pressure of 50 lb. at discharge of pump with water standing at 40 ft. Will take bids at later date.

STEAM SHOVEL—**Redwood City, Calif.**—San Mateo Co. plans purchasing steam shovel. $8,000 will be provided in budget to finance purchase. J. S. James, surv.

GENERATING PLANT—**Angola, Ind.**—City making plans new diesel engine and generating outfit at city plant. $23,400.

TANKS—**St. Louis, Mo.**—Industrial Oil Corp., 4501 Shaw Ave., plans installing two 20,000 gal. underground tanks for oil at 4501 Shaw Ave.

TANKS—**St. Louis, Mo.**—Remley Realty & Investment Co., 800 North 6th St., plans installing four 2,000 gal. and two 1,000 gal. underground storage tanks for gasoline, 501 Delmar Blvd.

STORAGE TANKS—**Warren, Pa.**—Riverside Acid Works, Inc. plans installing two 30x8x5 ft. steel storage tanks. $7,000.

BIDS ASKED

OILING, etc.—**San Leandro, Calif.**—Aug. 6, by E. F. Hutchings, city clk., furnishing, spreading oil on street surfaces for year ending June 30, 1935. Noted July 5.

FIBRE CONDUIT, etc.—**Chicago, Ill.**—July 18, by City, 22,000 ft. 3½ in. fibre conduit for Dpt. Streets & Electricity; etched license plates and badges for year beginning June 1, 1935; and metal vehicle license plates for year beginning Jan. 1, 1935. P. J. Brady, city clk.

POWER EQUIPMENT—**New York**—Aug. 7, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing power equipment for Jamaica Line of Independent City Owned Rapid Transit R.R. in Manhattan and Queens Boros.

†POWER TRANSFORMERS—**Knoxville, Tenn.**—July 19 (extended date), by Tennessee Valley Authority, Knoxville, 6 power transformers, for municipal distribution of city of Knoxville.

†CRANE—**Memphis, Tenn.**—July 20, by U. S. Eng., P. O. Box 97, 20 ton locomotive crane.

†DRAGLINES—**Memphis, Tenn.**—July 18, at U. S. Eng. Office, on Arkansas side of Mississippi River opposite here, about 1½ mi. below Harahan Bridge, draglines.

†TRANSMISSION—**Madison, Wis.**—July 18, by Dpt. Agriculture, Forest Service, transmission for experimental pulpwood grinder complete with accessories.

CONTRACTS AWARDED

TESTING EQUIPMENT—**Little Rock, Ark.**—Highway Comn., J. S. Cowgile, chn., to York Ice Mchry Co., St. Louis, Mo., temperature control unit for moisture cabinet, $336***to Baldwin-Southwark Corp., Phila., Pa., one 300-000 lb. universal testing machine, hydraulic type, $6,750***to Fisher Scientific Co., 709 Forbes St., Pittsburgh, Pa., 1 electric centrifuge, complete, $312***to Joe Lyons Mchy. Co., 114 North Louisiana St., Little Rock, dulin rotarex (motor driven) $180; ductility machine $275; freas electric oven, 12 x 12 x 12-in. $135; large electric drying oven $115***to Riehle Bros. Testing Machine Co., 1424 North 9th St., Phila., Pa., 1 abrasion machine duval type $392; 20 cement briquette molds $120. Grand total $8,615. Bids June 29, awarded July 2.

ROAD MAINTAINER—**Coalinga, Calif.**—E. J. McCroskey, city clk., 1 one man road maintainer, caterpillar type, equipped with scarifier block, power control and pneumatic tires, to Budd & Quinn, 1518 H. St., Fresno, $3,648. Bids June 18, awarded June 26.

†Federal Government.

Materials, etc. (Continued)

CIRCUIT BREAKERS—Los Angeles, Calif.—Dpt. Water & Power, 207 South Bway., furnishing circuit breakers, Spec. 3046, to Kelman Electric & Mfg. Co., 1650 Naud St., $49,360. Awarded July 3.

STORAGE TANK—Merced, Calif.—Crocker-Huffman Land & Water Co., Merced, 300,000 gal. elevated steel water storage tank at 12th and L Sts. pumping station, to Pittsburgh-Des Moines Steel Co., Rialto Bldg., San Francisco, $21,000. Awarded June 25.

EMULSIFIED ASPHALT—Oakland, Calif.—J. H. Kimball, secy. East Bay Municipal Utility Dist., 512 16th St., 175,000 gal. emulsified asphalt delivered f.o.b. trucks bidder's plant, to American Bitumuls Co., 860 45th Ave., $9,417. Bids June 19, awarded June 28.

LIME, etc.—Oakland, Calif.—J. H. Kimball, secy. East Bay Municipal Utility Dist., 512 16th St., to Melrose Building Materials Co., 4501 Tidewater St., furnishing 200 tons quicklime, delivered to El Cerrito, $3,150; 10 tons hydrated lime delivered El Cerrito, $193; 75 tons hydrated lime delivered Upper San Leandro Filter Plant, $1,444. Grand total $4,787. Bids June 13.

REDWOOD TIES—San Francisco, Calif.—T. A. Brooks, city purch. agt., City Hall, furnishing 5,000 6x8 in. x 8 ft. No. 1, split California redwood ties, to California Tie & Timber Co. (E. L. Moore), 106 Front St., Santa Cruz, 74c. each. Bids May 21, awarded June 22.

TRACK SUPPLIES—San Francisco, Calif.—T. A. Brooks, city purch. agt., 60 kegs 9/16x5½ in. track spikes and 30 kegs 1x4 in. track bolts, hexagon units, rolled thread, thread at least 2¼ in. long, to United Commercial Co., 234 Steuart St., and $5.70 and $9.10 respectively•••nine hundred and fifty 1 in. standard tie rods with nuts and 50 pairs joint plates for 141 lb. 9 in. girder rail, to Pacific Coast Steel Corp., 20th and Illinois Sts., 45c. and $6.25 respectively. Bids May 21.

ROCK and SCREENINGS—San Leandro, Calif.—E. F. Hutchings, city clerk, furnishing rock and screenings for year ending June 30, 1935, to San Leandro Rock Co., 2485 Washington St., redrock macadam $1.05 per cu.yd.; redrock 4 in. macadam $1.05 per yd.; screenings $1.05 per cu.yd.; rock fill at 7c. per cu.yd.; concrete rock at $1.45 per cu.yd.; crushed rock screenings at $1.45 per cu.yd.; birds eye at $1.65 per cu.yd.; rock dust at 75c. per cu.yd. Bids June 18, awarded June 22.

CAST IRON PIPE—South Pasadena, Calif.—City Council, furnishing 5,060 ft. 10 in., 1,850 ft. 6 in. and 350 ft. 4 in. c.i. pipe Class 150, sandspun pipe, to U. S. Pipe & Fdry. Co., 2326 East 8th St., Los Angeles, $8,067. Bids June 13. Noted June 28.

BOILER — Stockton, Calif. — Supervs. San Joaquin Co., furnishing, installing 4 drum Sterling new water tube boiler at San Joaquin County, General Hospital, to C. C. Moore & Co., 450 Mission St., San Francisco, $6,700 plus $7,405 for stack.

SPECIAL CASTINGS—Chicago, Ill.—City, 103 tons standard special castings for 3- to 24-in. water pipe, to Rudisill Fdry. Co., Chicago, $7,854. Bids June 13, awarded July 3. Noted June 7.

WOOD BLOCKS—Chicago, Ill.—City, 500 sq.yd. creosoted wood paving blocks, to Republic Creosoting Co., 2500 South Damen St., $1,160. Bids May 24.

BRIDGE MATERIAL—Indiana—State Hy. Comn., Indianapolis, bridge material, to Sherwin Williams Co., 219 North Senate Ave., Indianapolis, $30,076.

CALCIUM CHLORIDE—Indiana—State Hy. Comn., Indianapolis, 430 tons calcium chloride, Fort Wayne, to Solvay Sales Co., 230 South Pennsylvania St., Indianapolis, $9,847. Bids June 19. Noted June 14.

CRUSHED AGGREGATE—Indiana—State Hy. Comn., Indianapolis, 1,500 tons crushed aggregate, to John Dehner Co., Inc., Fort Wayne, $2,400. Bids June 28. Noted June 21.

CRUSHED AGGREGATE, etc.—Indiana—State Hy. Comn., Jefferson City, 500 tons crushed aggregate at Osceola, to France Stone Co., Kenneth, $825; 4,066 ft. lumber at Indianapolis, to Allen A. Wilkinson, 907 East Michigan Ave., Indianapolis, $235. Bids June 22.

CRUSHED STONE—Kentland, Ind.—Bd. City Comrs., crushed stone, to A. M. Skinner, Kentland, $1,734; and to Newton County Stone Co., Kentland, $735.

CRUSHED STONE—North Vernon, Ind.—City, crushed stone to Conley Shafer, North Vernon, $1,893; and to H. Tucker, North Vernon, $856.

GRAVEL—Reiffsburg, Ind.—Bd. Comrs. Wells Co., P. Scott, aud., 4,100 tons gravel, to S. and L. Gravel Co., Bluffton, $4,275.

CRUSHED STONE—Rockport, Ind.—City, crushed stone, to Bedford Nugent Co., Bedford, $1,602.

ROAD OIL—Tell City, Ind.—Town, J. W. Brumfield, councilman, furnishing road oil, to Troy Refining Co., Tell City, $5,238.

STRUCTURAL STEEL—Sioux City, Ia.—Woodbury Co., 108,419 lb. structural steel for 2 bridges, to Haakinson & Beatty, Sioux City, $4,427. Bids June 18.

GATE VALVES—Boston, Mass.—City, Supply Dpt., W. W. Loomis, supt., City Hall Annex, 70 pcs. 30 in. gates with 6 in. by-pass gates, to Water Serv. Dpt., to Michigan Valve & Fdry. Co., 3631 Parkinson St., Detroit, Mich., $7,343. **P.W.A.** Bids June 19, awarded July 3. Noted June 13.

PUMP—Minneapolis, Minn.—City, furnishing, installing 1 deep well pump 3,000 g.p.m. capacity at city work house, to Central Supply Co., 312 South 3d St., $1,150. Bids June 12.

ROAD OIL—Brentwood, Mo.—City, K. C. Parcher, clk., furnishing, applying 40,000 gal. road oil on various city streets, to Missouri Petroleum Products Co., LaDue Rd. and Terminal R.R. tracks at 6.5c. per gal. Bids May 22.

ROAD OIL—Ferguson, Mo.—City, W. A. Thomas, city engr., furnishing, applying 30,000 gal. road oil to city streets, to Missouri Petroleum Products Co., LaDue Rd. and Terminal R.R., Clayton, at 6.63c. per gal.

CEMENT — Milwaukee, Wis. — Wisconsin State Hy. Comn., 8,000 bags portland cement for Dists. 1 and 2, to N. J. Pipkorn, 2244 North Humboldt Ave., and 8,000 bags for Dist. 3, to Schmidt Bros., Hales Corners, both at 86c. per bag for less than 100 bags; 80c. per bag for 100 bags or more; and 70c. for 528 bags or more less 10c. for bags disc. 5-10. Bids June 27, awarded June 27.

GATE VALVES—Toronto, Ont.—City, 16 and 24 in. gate valves, to John T. Hepburn Ltd., 18 Van Horne St.; 36 in. gate valves, to Dominion Wheel & Foundries Ltd., 171 Eastern Ave.

FOREIGN

Australia—Aug. 14, by Deputy Director Dpt. Posts & Telegraphs, **Melbourne,** supplying loadcoil posts•••**Melbourne** City Engineer in market for two air filters for supplying air to existing 4,400 kw. turbo-alternators; Chairman State Electricity Comn. of Victoria, in market for supplying 11,000 volt. switchgear and accessories, **Melbourne**•••Chairman of Harbor Bd. **Mackay,** taking bids completing outer harbor, incl. breakwaters, wharf, railway, etc.

China—Aug. 2, by Chinese Purchasing Comn., through Fox & Mayo, engrs., 155 Dashwood House, London, England, supply of switches and crossings, 138 sets for 43 kg. rails and 46 sets for 60 lb. rails, lock gates, Larssen piling, square corrugated reinforcing bars and pneumatic tools.

Egypt, Cairo—Aug. 15, by Minister of Interior, constructing pump house, supplying and installing low pressure centrifugal pump with output of 100 litres to a manometric head of 13 meters, direct connected to 6 hp. gasoline or heavy oil engine of vertical 4 stroke type and supplying, erecting 18 cu.meter capacity water tank, laying all piping••Aug. 20, by Ministry of P. Wks., supply of gas heated sterilizing plant for hospital use.

England,—Warrington City Engineer preparing plans sewerage scheme, $1,750,000••• **Barnsley** City Council bids in July, additional construction at water storage reservoir, $905,000•••**Malton** Town Council voted $175,000 for sewerage disposal plant•••**Bakewell** Town Council soon takes bids sewage plant, $128,750 voted.

Germany, Berlin—Friedrich W. Hinkel, Fregastrasse 40, in market for talcum. Offers with samples and analyses are asked for. In quoting figure I.R.M. to equal $.2382 at par.

Irish Free State—Letterkenny Town awarded contracts Mental Hospital, to R. Colhoun & Sons, Derry, $250,000•••**Dublin** Government made commitments for housing scheme, $22,000,000.

South Africa—Aug. 1, by **Worcester** City Engineer, vertical steam boiler and 1,000 kw. turbine and d/c generator with all piping••• **Capetown** City in market for 500 kw. and 300 kw. mercury arc rectifier with accessories and d/c switchboard.

South Africa, Johannesburg—July 30, by J. H. Watermeyer, mgr. South African Railways & Harbors Administration, for supplying boiler and superheater, flue tubes and superheater elements for year 1935, also vacuum brake parts, such as brass balls, double brass balls, valves with levers and hose couplings; Aug. 13, for 1 electrically driven Goliath crane for ash handling plant at Braamfontein for supplying 44,050 lb. red lead, 2,850 lb. white lead, 330,000 gal. turpentine and 14,280 gal. white spirits.

Union Soviet Socialist Republics—Commissariat of Heavy Industry, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, chemical apparatus plant addition, day labor. To exceed $1,000,000.

Union Soviet Socialist Republics—Textile Combine Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, knit goods mills, 11,000 tons annually, at Omsk and Samara, by day labor. To exceed $1,000,000.

Venezuela—Standard Oil Co. of Venezuela and Pantipec Consolidated Oil of Venezuela, c/o Standard Oil Co. of New Jersey, 26 Bway., New York, development of oil properties, drilling, etc., by day labor. To exceed $100,000.

PUBLIC BUILDINGS

PROPOSED WORK

Calif., Bakersfield—City, library, 17th and K Sts. $274,000 P.W.A. allotment rescinded.

Calif., Placentia — Placentia Union High School Dist., defeated $200,000 bond issue for high school. T. C. Kistner, 814 Architects Bldg., Los Angeles, archt. Noted May 31.

Calif., San Jose—City, rejected bids 2 story, rein.-con. municipal auditorium. Est. $375,000. $422,000 available for work. Binder & Curtis, 35 West San Carlos St., archts., will revise plans and new bids will be asked. Noted June 14.

†Calif., Sawtelle—Vet. Bu., Arlington Bldg., Wash., D. C., making plans constructing administration building for Veterans Administration Facility. $250,000.

Calif., Sebastopol—Analy Union High School Dist., voted $240,000 rein.-con. high school, L. Stone & J. R. Rowell, 354 Hobart St., Oakland, archts. Noted May 24.

†Conn., New London—Coast Guard Academy, Mohegan Ave., plans reconditioning training station, $50,000; erecting airplane hangars $110,000.

Idaho, Coeur D'Alene—City voted $600,000 bonds to secure P.W.A. loan for municipal hydro-electric light and power plant.

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., plans replacing 2 hydro-electric 8,500 K.V.A. units and 2 exciters each 200 hp. and other miscellaneous work, at Lockport Lock on Sanitary Dist. Canal at Lockport. $800,000. P.W.A. grant of $205,200 approved. P. Harrington, c/o owner, engr.

Ia., Des Moines—City did not hold election June 4 and no action has been taken since that time to vote on $3,000,000 revenue bonds for acquiring, maintaining and operating municipal light and power plant. Noted May 31.

Mass., Quincy—City, C. A. Ross, mayor, City Hall, voted down plans for hospital administration building, $150,000. P. Aoletti, 168 Dartmouth St., Boston, archt. Noted Dec. 21.

Mass., West Springfield—Town, Superintendent Schools, 126 Park Ave., plans being completed by McClintock & Craig, 458 Bridge St., Springfield, and takes bids in July for rebuilding 3 story, 60x125 ft., brick school Park Ave. $105,000. Noted May 31.

Mich., Alpena—Alpena Co. voted $100,000 to secure P.W.A. financing for 2 story, basement, 68x96 ft. brick, rein.-con. court house. Total $128,000. W. Kuni, Francis Palms Bldg., Detroit, archt. Noted Sept. 7, under "Contracts Awarded."

†Mich., Detroit—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by A. Kahn, Inc., New Center Bldg., Detroit, 2 story, basement, parcels post building, 14th Ave. and Daizell St. $2,100,000. Allotment made under Deficiency Emergency Appropriation Bill. Noted Mar. 23, 1933.

Minn., Virginia—Voted $200,000, for 3 story, basement, 42x142 ft., rein-con., brick hospital. J. A. Codding, Virginia, and Erickson Co., 709 Alworth Bldg., Duluth, archts. Noted June 14.

Mo., Moberly—City Council, election July 24, $566,000, municipal light and power plant, $700,000 P.W.A. funds allotted. Russell & Axon, Roosevelt Bldg., St. Louis, consult. engrs. Noted June 21.

N. J., Trenton—State Hy. Comn., Trenton, rejected bids June 25, 2 story, laboratory building, $117,859. Will readvertise.

N. M., Mountainair—Mountainair School Dist. plans school, $150,000. Applied for P.W.A. loan.

N. Y., Auburn—City plans generating plant and street lighting system, $310,000 loan and grant approved by P.W.A. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo., engrs. Noted Feb. 1.

N. Y., Buffalo—Bd. Educ., E. C. Hartwell, supt., sketches 2 elementary schools and addition to School 18. To exceed $105,000. Architect not appointed.

N. Y., Elmira—City bids in August steel school, plain found, $125,000. P.W.A. project. R. T. Bickford, 215 West Water St., archt. Noted Apr. 26.

†N. Y., Endicott—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by W. H. Whitlock, 607 Chenango St., Binghamton, limestone, steel post office, $132,000. G. O. Van Nerta, Federal Bldg., Wash., D. C., engr. Noted June 26, 1933.

N. Y., New York—Dpt. Markets, Municipal Bldg., plans by S. Oxhandler, 250 Park Ave., 1 story, market Exterior and 150th Sts., $417,000; and 3 story, store and market, Cromwell Ave. and Exterior St., $300,000.

N. Y., Port Jefferson—Port Jefferson School Dist. plans by G. Perry, Port Jefferson, high school. Plant Hotel site. $280,000. Noted Mar. 1.

N. Y., Schenectady—State Div. Military & Naval Affairs, Capitol, Albany, sketches by W. E. Haugaard, State Office Bldg., steel armory, $450,000. T. F. Farrell, State Office Bldg., Albany, engr.

N. C., Lincolnton—City, filed application with P.W.A. for loan to finance construction of municipal power plant. Est. $6,000,000.

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†Federal Government.

Public Buildings (Continued)

†O., Cleveland—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by L. A. Simon, Federal Bldg., altering federal and post office building, Superior Ave. and Public Square. $200,000.

Okla., Enid—Defeated $120,000, for high school. Project indefinitely postponed. P.W.A. project. C. H. Rightmore, city engr. Noted May 10.

Pa., Reading—Reading School Dist., 8th and Washington Sts., postponed bids to have been opened July 6 for approximately 1 month for school. $1,500,000. Associated Architects, 147 North 5th St., archts. Noted June 28.

Tex., Kennedy—City, c/o E. P. Ruhmann, election July 24, $161,000 light and power plant. Est. $161,500.

†Tex., Three Rivers—Beaux Arts Gardens, c/o P. H. Ness, Beaumont, revising plans constructing fifty 1 story, tile, stucco subsistence homesteads. $125,000. Former bids rejected. H. F. Kuehne, Austin, and Three Rivers, archt. Noted May 31.

Wis., Milwaukee—Wisconsin Consistory, G. Eller, chn., 713 East Wells St., plans by Clas & Clas, Inc., E. A. Johnson and H. J. Grasshold Assoc., 759 North Milwaukee St., consistory building, East State St.

B. C., Victoria—Victoria Steam Heating Co, Ltd., P. Fox, archt., making plans central heating plant, Wharf St, $200,000.

N. S., Amherst—Dpt. P. Wks., Ottawa, soon takes bids public building. $150,000.

Que., Montreal — Dpt. National Defence, Ottawa, Ont., soon takes bids armory for 17th Duke of York's Canadian Hussars. $200,000.

Que., Montreal—Postmaster General, Ottawa, Ont., preparing plans postal station on site purchased in Notre Dame de Grace Ward. $136,000.

BIDS ASKED

Ind., Indianapolis—July 20, by School Comrs., A. B. Good, bus. dir., 150 North Meridian St., steam heating plant, ventilating system, remodeling gymnasium at Broad Ripple High School, 1115 East 63d st. $67,000. Noted May 24.

Ind., Star City—July 20, by School Comrs., M. Bonnell, trustee, Pulaski Co., new steam heating, new boilers, reconstructing heating and ventilating system in school buildings.

Ind., Terra Haute—July 23, by Bd. Educ., high school auditorium at Garfield School, 12th and Maple Sts., $150,000. Miller & Yeager, 209 Opera House Bldg., archts. Noted June 14.

†La., Holma—July 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., post office.

Mass., Boston—July 16, by Dpt. School Buildings, W. W. Drummey, supt. of Construction, 11 Beacon St., addition to plumbing system at Louis Prang School, Bartlett St., Roxbury; July 12, furnishing, erecting new chemical laboratory in Mechanics Arts High School, Belvidere and Dalton Sts.

Mass., Harding—July 17, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, power plant alterations, furnishing, setting 2 boilers; generating equipment and switchboard, 2 stokers at Medfield State Hospital. $183,100 P.W.A. loan and grant. W. & L. Eng. Co., 694 Washington St., Boston, engrs.

Mass., Northampton—July 17, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, piping, boiler settings, electrical work for power plant at State Hospital, P.W.A. Docket 1027, Project M-14. To exceed $25,000.

†Minn., Cass Lake—See "Contracts Awarded."

Miss., Laurel—July 23, by Mayor and Bd. Aldermen, constructing partial power and light plant in connection with city waterworks, on self-liquidating plan not exceeding $163,000 in cost, according to plans and specifications on file in office of J. M. Williams, city clk.; new municipal power plant and electric light distributing system on self liquidating plan not exceeding cost of $400,000.

Mo., Columbia—July 17, by Columbia School Dist. Boone Co., at Hickman High School, constructing Robert E. Lee Elementary School, altering and additions to Jefferson Junior High School, and Ridgeway and Douglass Schools. P.W.A. project. Bonsack & Pierce, Inc., 411 Olive St., St. Louis, engrs. Noted May 10.

†Mont., Browning—See "Contracts Awarded."

†Nev., Owyhee—See "Contracts Awarded."

†N. J., Fort Monmouth—July 20, by Con. Q.M., headquarters building.

†N. M., Carlsbad—July 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., post office. Noted June 7.

N. Y., Lake Placid—July 19, by Village, brick, steel high school, plain found. $375,000. P.W.A. project. H. O. Fullerton, 111 State St., Albany, archt. Noted Apr. 5.

N. Y., Utica—July 24, by Bd. Educ., 13 Elizabeth St., Utica, 3 and 4 story, brick, steel, stone school, plain found. $300,000. Bagg & Newkirk, U. G. and E. Bldg., Utica, engrs. and archts. Noted June 21.

†N. C., Cherokee—See "Contracts Awarded."

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†N. C., New Bern—July 18 by Treas. Dpt. at office Sup. Archt., Wash., D. C., special interior lighting fixtures in Post Office and Court House.

N. D., Bismarck—July 20, by Bd. Educ., R. Pendwarden, clk., 2 story, basement, brick, steel school, $350,000. P.W.A. project. Hewitt & Brown, 1200 2nd Ave. S., Minneapolis, Minn., assoc. archts. Ritterbush Bros., Bismarck, archts. Noted Oct. 12.

O., Columbus—July 17, by W. J. Lucks, dir. Serv., 3 story, and ¼ of 4th floor, basement, 65x180 ft., brick, stone, concrete, steel city hall addition, West Broad St. Allied Architects, 21 West Broad St., archts. $400,000. P.W.A. project.

O., Gambier—July 23, by Bd. Educ., H. M. Jacobs, clk., 2 story, basement, 55x70 ft. and 1 story, basement, 50x70 ft. brick, steel, concrete school and gymnasium addition. Harsh & Davies, 145 North High St., Columbus, archts. P.W.A. project.

†Ore., Warm Springs — See "Contracts Awarded."

Pa., Bradford—July 20, by J. B. Butterworth, supt., Bradford Schools, 3 schools, brick, steel, 2nd, 3rd and 6th ward buildings, Lawrie & Green, 3rd and Forster Sts., Harrisburg, archts. F. Fensel, Hooker Fulton Bldg., Bradford, assoc. archts. Est. $600,000. Noted May 31.

†W. Va., Princeton—July 18, by Treas. Dpt. at office Sup. Archt., Wash., D. C., superstructure of post office. Adv. EN-R July 12. Noted July 13, 1933.

Wis., Algoma—July 17, by Bd. Educ., A. D. Shimeh, pres., 2 story, basement, 90x340 ft., brick high and grade school, plain found. $180,000. Foeller & Schoeber, 310 Pine St., Green Bay, archts. Noted Feb. 22.

Ont., Fort William—July, 24, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, concrete, steel public building, $425,000. Pub. Wks. Architects Dpt., Ottawa, archt.

Que., Montreal—July 24, by Secretary Dpt. P. Wks., Ottawa, Ont., 2 story, basement, 87.7x90 ft., brick, steel public building, plain found., Notre Dame de Grace, $136,000. T. W. Fuller, Dpt. P. Wks., Ottawa, Ont., archt.

Que., Montreal—Aug. 10, by Secretary Dpt. Wks., Ottawa, Ont., 6 and 7 story, basement, 338.65x129.6 ft., brick, steel post office, caisson found. $1,800,000. T. W. Fuller, Dpt. P. Wks., Ottawa, Ont., archt.

CONTRACTS AWARDED

Calif., Los Angeles—University of California, West Los Angeles, college building addition, to Sarver & Zoss, 1015 West 4th St., $177,260 •••electrical work to Moore Electric Co., 321 West 3rd St., $20,636.

†Calif., Los Angeles—Vet. Bu., Arlington Bldg., Wash., D. C., revision to General Mess Building 13, to C. J. Dorfman, 143 North LaBrea Ave., $18,585.

†Calif., Oakland—J. Plachek, archt., Berkeley Bldg., Berkeley, general contract reconstructing office buildings, for Federal Land Bank, to Lindgren & Swinerton, Inc., 225 Bush St., San Francisco, $87,632•••electrical work, to Scott-Butner Electric Co., 19 Grand Ave., $4,900. Noted June 25.

†Calif., San Diego—Yards & Docks, Navy Dpt., Wash. D. C., final assembly shop, to Gill Electric Co., 1227 4th Ave., $2,375.

Conn., New London—Connecticut College for Women, K. Blunt, pres., elevator for Harkness Dormitory, 3 story, basement, 60x150 ft., to Chelsea Elevator Co., 101 Park Ave., New York•••granite, to Leiper Bros., Waterford••• marble-tile, to Keramic Tile Co., New London. Noted June 7, under "Contracts Awarded."

†D. C., Wash.—Treas. Dpt. at office Sup. Archt., Wash., D. C., interior lighting fixtures, to Lightolier Co., 11 East 36th St., New York, N. Y., $13,400.

†Ill., Chicago—Vet. Bu., Arlington Bldg., Wash., D. C., addition to Storehouse Building 32, to N. W. Pickus & Son, Waukegan, $18,995.

Ill., Springfield—City, to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., furnishing 23,000 volt indoor metal-clad switchgear structure with main and transfer bus, incl. impulse and breaker interrupting tests, $53,665; switchboards, $30,195; one 60 cell 240-ampere storage battery, $1,329. Grand total $85,189. **P.W.A.** Bids Apr. 18.

Ill., Urbana—Bd. Educ., 3 story, basement, 64x275 ft. and 45x80 ft. school, incl. gymnasium addition, West and University Aves., to J. Moroff & Son, Kankakee, $279,000•••plumbing and heating, to A. W. Murray Co., Hoopeston, $61,000•••electrical work to E. A. Koeneman Electric Co., 1408 Delmar Blvd., St. Louis, Mo., $10,100. Grand total $350,100. **P.W.A.** Noted Feb. 8.

†Ind., Marion—Vet. Bu., Arlington Bldg., Wash., D. C., constructing Laundry Building 79, to Dunlap & Co., Inc., 522 Jackson St., Columbus, $44,050; improving roads and street lighting, to Kokomo Constr. Co., 628 Armstrong Landon Bldg., Kokomo, $18,299. Noted July 5.

Ind., Stendal—School Comrs., C. Ferguson, trustee., steam heating plant, water system plumbing and electric fixtures, to P. Partenheimer, Huntingburg. Est. $25,000. Bids July 2. Noted May 24.

†Ia., Knoxville—Vet. Bu., Arlington Bldg., Wash., D. C., porches on Buildings 1, 3, 27 and 30, to Mads Madson Co., Natl. Bldg., Minneapolis, Minn., $27,980.

†Kan., Leavenworth—Vet. Bu., Arlington Bldg., Wash., D. C., new smoke breeching, to American Steel Wks., 1211 West 27th St., Kansas City, Mo., $9,094.

†La., New Orleans—Treas. Dpt. at office Sup. Archt., Wash., D. C., air conditioning marine Hospital, to American Heating & Plumbing Co., 829 Baronne St., $3,997. Bids Mar. 28. Noted Mar. 15.

†Me., South Portland—Superintendent Lighthouses, 1st Dist., Portland, 3 story, basement, 46x81 ft. office and storehouse, High St., Proposal 1896, to Concrete Constr. Co., 11 Garfield Ave., Chelsea, Mass., $65,785. Noted May 10.

Md., College Park—Smith & May, archts., Baltimore Trust Bldg., Baltimore, structural steel for 3 story, basement, 42x200 ft. women's dormitory, for University of Maryland, to Dietrich Bros., Baltimore•••reinforcing steel, to National Building Supply Co., 210 North Franklintown Rd., Baltimore•••elevators, to General Elevator Co., Bush and Ridgely Sts., Baltimore•••plumbing, heating and ventilating, to Mumford Eng. Co., Frederick. Noted May 17, under "Contracts Awarded."

Md., Westminster—O. E. Adams, archt., 329 North Charles St., Baltimore, general contract 4 story, basement, 42x130 ft. and 42x82 ft. girls dormitory, plain found., for Western Maryland College, to Thos. Hicks Sons, 108 West Madison St., Baltimore, $131,660•••heating and plumbing, to Westminster Hardware Co., Westminster, $19,448•••electric wiring, to D. J. Baile, Westminster, $7,000. Grand total $158,108. Noted June 7.

Massachusetts—M. J. Walsh & Sons, general contractors, 1412 Dwight St., Holyoke, heating and ventilating for 2½ story, basement, 43x54 ft. police substation on State Hy., Shelburn Falls, to Holyoke Valve & Hydrant Co., 150 Race St., Holyoke•••plumbing, to Jas. B. Kennedy, 1 Newton Pl., Greenfield•••electrical work, to M. L. Schmitt, 198 Chestnut St., Springfield•••L. M. Witherell & Sons, general contractors, 29 Court St., Taunton, heating and plumbing for 2½ story, basement, 43x54 ft. police substation on State Hy., Norwell, to Babbitt & Simmons, 94 Weir St., Taunton••• electrical work, to B. T. Mowry, Raynham Center. Bids May 10, awarded June 28. Noted June 28, under "Contracts Awarded."

Mass., Amherst—E. J. Pinney Co., Inc., general contractors, 220 Dwight St., Springfield, heating for 2 story, basement library addition, to Acme Heating & Ventilating Co., 13 Hawkins St., Boston•••plumbing, to R. E. Davies & Son, 12 Market St., Northampton•••electrical work, to Lord Electric Co., 303 Columbus Ave., Boston, for Commonwealth of Massachusetts, Bd. Trustees, Treas. Mass. State College, Amherst. Bids Apr. 20, awarded June 28. Noted May 17, under "Contracts Awarded."

Mass., Dorchester—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, furnishing pulverized coal burning equipment at Boston State Hospital, P.W.A. project M-2, Docket 960, to Riley Stoker Corp., 27 State St., Boston, $27,744; coal handling equipment, to Waghorne-Brown Co., 44 School St., Boston, $16,694. **P.W.A.** Bids June 1, awarded June 26.

Mass., Fitchburg—Commonwealth of Massachusetts, Dpt. Educ., State House, Boston, electrical work for 1 story, basement, 116x165 ft. practical arts building at State Teachers College, to E. Y. Bohaker, 271 Highland Ave., $10,366. Bids May 24, awarded June 29. Noted June 28, under "Contracts Awarded." **P.W.A.**

Mass., Foxboro—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 2 story, basement, 38x206 ft., brick, cast stone tuberculosis pavilion and verandas, at State Hospital, incl. heating, plumbing and electrical work, to Thos. O'Connor & Co., 238 Main St., Cambridge, $191,285. **P.W.A.** Bids June 13, awarded June 29.

Mass., Foxboro—Commonwealth of Massachusetts, Dpt. Mental Diseases, 1 story, basement, 84x127 ft., brick, granite, limestone, assembly building and tunnel, concrete found., at State Hospital, incl. heating, plumbing, electrical work, to W. Hanson, 567 Pleasant St., Brockton, $113,182. **P.W.A.** Bids June 11, awarded June 29. Noted June 7.

Mass., New Bedford — Matthew Cummings Co., 43 Tremont St., Boston, general contractors, heating for 3 story, basement, 152x160 ft. high school addition, to V. J. Kenneally Co., 251 Causeway St., Boston; plumbing, to C. H. Cronin, Inc., 14 Byron St., Boston, for City, O. D. Kelleher, chn. Property Comn., City Hall. Noted June 14, under "Contracts Awarded."

Mass., Newton—City, H. A. Hageman, P. Building Comn., 2 story, basement, brick, stone, granite elementary school, concrete found., Nevada St., to J. Slotnick Co., 38 Newbury St., Boston, $283,000. **P.W.A.** Bids June 5.

Mass., Norfolk—Commonwealth of Massachusetts, Dpt. Correction, Supt. State Prison Colony, general contract 2 story, basement, 92x120 ft., brick, cast stone, granite school and library, concrete found., at State Prison Colony, to S. & R. Constr. Co., 10 Tremont St., Boston, $106,351. Bids Apr. 20, awarded June 29. Noted Apr. 12.

Mass., Tewksbury—Commonwealth of Massachusetts, Dpt. P. Welfare, trustees of State Infirmary, general contract 1 story, basement, 141x223 ft. kitchen and dining building, to

†Federal Government.

Public Buildings (Continued)

E. J. Rappoli, 515 Mass. Ave., Cambridge, $258,444***plumbing, to J. S. Cassidy, Inc., 133 Austin St., Cambridge, $23,136***heating and ventilating, to V. J. Kenneally Co., 251 Causeway St., Boston, $45,331***electrical work, to M. B. Foster Electric Co., 514 Atlantic Ave., Boston, $11,349. Grand total $338,260. **P.W.A.** Bids June 18, awarded June 29. Noted June 14.

Mass., Waverly—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, building addition and alterations at Walter E. Fernald State School, to Engineering Service & Constr. Co., 161 Devonshire St., Boston, $53,130 ***piping for hot water system, to Jas. S. Cassedy, Inc., 133 Austin St., Cambridge, $68,600. **P.W.A.** Bids June 13, awarded July 5.

†Mich., Towas—U. S. Coast Guard, altering and additions at Towas Coast Guard Station, to E. L. Carlson Constr. Co., Detroit, Mich., $11,000. Bids June 1, awarded June 30.

†Minn., Cass Lake—Bureau Indian Affairs, 7th and D Sts., Wash., D. C., hospital, by force account. $100,000. Site not selected. Schmidt, Garden & Erikson, 104 South Michigan Ave., Chicago, Ill., archts. Working on sketches.

Mo., Macon—City, furnishing one 315 hp. Murray long-level drum type A water tube boiler with Foster-Wheeler super-heater, Bayer soot blower and Copes feed water regulator for municipal light and power plant and waterworks, to Murray Iron Wks., Co., Burlington, Ia., $12,103***1 Harrington stoker and Clarage fan, to Riley Stoker Corp., Worcester, Mass., $4,452. Bids June 28. **P.W.A.** Noted June 21.

†Mont., Browning — Bureau Indian Affairs, 7th and D Sts., Wash., D. C., hospital on Blackfeet Indian Reservation, Glacier Co., force account. $172,500. Schmidt, Garden & Erikson, 104 South Michigan Ave., Chicago, Ill., archts. Working drawings started.

Neb., Hastings—City, light plant equipment, incl. enlarging turbine equipment, new boiler, super heater, and firing equipment, to Municipal Serv. Co., Dwight Bldg., Kansas City, Mo. Est. $64,000. **P.W.A.** Bids June 18. Noted June 7.

†Nev., Owyhee—Bureau Indian Affairs, 7th and D Sts., Wash., D. C., hospital on Western Shoshone Reservation, by force account. $75,000. Schmidt, Garden & Erikson, 104 South Michigan Ave., Chicago, Ill., archts. Working on sketches.

N. H., Portsmouth—Portsmouth Hospital, E. Seybold, pres. Bd. Trustees, Portsmouth, heating and plumbing, for 3 story, basement, 35x100 ft. maternity ward, to J. H. Stevens, 46 Manchester St., Manchester. Awarded June 22. Noted June 7, under "Contracts Awarded."

†N. Y., Bath—Vet. Bu., Arlington Bldg., Wash., D. C., Storehouse Building 75, to D. S. Koggman Co., 315 Market St., Patterson, N. J., $26,800. Bids June 29. Noted June 21.

N. Y., Bayside—Bd. Educ., 500 Park Ave., New York, general contract Bayside High School, to Royal Rice Co., Inc., 136 East 57th St., New York, $1,338,370***sheet metal duct work, to A. T. Morris Co., 41-15 23rd St., Long Island City, $17,760. **P.W.A.** Bids June 25. Noted June 21.

N. Y., Jamestown—Adjutant General, Capitol, Albany, additional heating work for state armory, to Chatfield & Sharp, 117 E. 3rd St., $2,315. Noted May 24.

N. Y., Middletown—Dpt. Mental Hygiene, State Office Bldg., Albany, connecting corridors, etc., to Rademacher Bros., 343 Fox St., Buffalo, $16,347. Bids June 6. Noted May 24.

†N. Y., New York—Treas. Dpt. at office Sup. Archt., Wash., D. C., exterior betterment and interior renovation, etc., for U. S. Custom House, to Chapman-Kruge Eng. Co., 155 East 42nd St., $10,975 and $45,875. Bids June 29.

†N. C., Cherokee—Bureau Indian affairs, 7th and D Sts., Wash., D. C., hospital, force account. $80,000. Schmidt, Garden & Erikson, 104 South Michigan Ave., Chicago, Ill., archts. Working drawings nearly completed.

O., Bryan—City, furnishing, installing new diesel engine and other necessary equipment in municipal light plant, consisting of 1,500 hp., 6 cylinders and 257 r.p.m. capacity, incl. 1,000 kw. generator, to Nordberg Mfg. Co., Milwaukee, Wis., $71,675. Contractors agreed to allow $16,675 for 2 of obsolete small engines which will be discarded.

O., Columbus—Bd. Trustees, Ohio State University, C. E. Steeb, secy., 5 story, basement, brick, concrete, steel stone addition to Mack Hall Dormitory at Ohio State University, to H. R. Hagg Co., 1229 East 3rd St., Dayton, $89,092*** heating and ventilating and plumbing, to W. H. Spohn Plumbing Co., 211 North 6th St., $4,460 and $9,743 respectively*** electrical work, to Electric Power & Equip. Co., 51 East Chestnut St., $4,134. Grand total $107,429. **P.W.A.** Bids June 6. Noted May 17.

†O., Fairfield—Con. Q.M., fifty 1 story brick garages, Patterson Field, to Spence Bros., 203 Brewer Arcade, Saginaw, Mich., $55,790. Bids June 29.

Okla., Oklahoma City—Bd. Educ., 2 story, basement, 47x73 ft. addition to Washington School, Walker St., to E. Nicholson & Cramer, Key Bldg., $27,800***3 story, basement, 135x100 ft. gymnasium for Classen High School, 18th St., to D. A. Harmon, Elks Bldg., $54,673 ***2 section stadium addition for Taft School, to Manhattan Constr. Co., 1st Natl. Bank Bldg., $35,500***repairing and remodeling 6 schools, to Beaty & Schwertz, 519 West Main St., $11,342***steel stadium addition at Capitol Hill High School, and 7 tennis courts for schools, to C. Morean, Huckins Hotel, $13,585 and $11,089 respectively. Grand total $153,989. **P.W.A.** Bids June 25. Noted June 21.

†Ore., Warm Springs—Dpt. Indian Affairs, 7th and D Sts., Wash., D. C., hospital, force account. $85,000. Schmidt, Garden & Erikson, archts., 104 South Michigan Ave., Chicago, Ill. Will complete plans in 3 weeks.

†Pa., Aspinwall—Vet. Bu., Arlington Bldg., Wash., D. C., altering elevators in Building 1, to Haughton Elevator & Mchy. Co., 1103 Vermont Ave. N.W., Wash., D. C., $3,100.

†Tenn., Old Hickory—Treas. Dpt. at office Sup. Archt., Wash., D. C., post office, to A. Farnell Blair, St. James, La., $38,935. Bids Apr. 27. Noted Apr. 12.

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Wis., Milwaukee—Bd. School Directors, to Watson Eng. Corp., 152 West Wisconsin Ave., acoustical work in Forest Home School, $1,250; in Oklahoma Avenue School, $1,015; Wisconsin Ave. School, $1,910***to U. S. Gypsum Co., 439 West Gregon Ave., Girls Junior High School, $1,480; in Grant School, $1,480; in Green Bay School, $1,390; Riley School, $1,480 ***to Armstrong Cork & Insulation Co., 236 West Wisconsin Ave., Oklahoma Ave. School, $1,795; South Division High School, $1,596 ***to Parkson Constr. Co., 2347 North 45th St., surfacing playground at Dover School, $3,088; at Eugene Field School, $897; at Palmer School, $1,149***to Kroening Eng. Corp., 4500 West Mitchell St., Greenfield School, $4,872; in G. H. Walker Junior School, $5,753***to Cyclone Fence Co., 1949 Underwood Ave., Wauwastosa, fencing at Greenfield School, $800; at Palmer School, $163***to C. Hennecke Co., 3225 North Pierce St., altering steel framing Forest Home School, $1,878; steel and iron for Roosevelt Junior High School, $1,038 ***to E. C. Knuth & Co., 2919 West Fond du Lac Ave., altering Roosevelt Junior High School, $6,150; altering Maryland Ave., School, $3,050***to H. Needner & Co., 909 North Water St., altering boys shower at Bay View High School, $554. Grand total $42,788. Bids June 25.

Ont., Toronto — Western Hospital, 391 Bathurst St., general contract 14 story fireproof hospital pavilion for private patients, to Jos. Wilde Co., Ltd., 10 Dublin St. Est. $800,000. Noted July 27.

COMMERCIAL BUILDINGS

PROPOSED WORK

Conn., Bridgeport — National Greyhound Lines, Inc., Water St., plans 2 story, brick, steel hotel-terminal on site of Atlantic Hotel, Water St. and Fairfield Ave. $250,000. Private plans.

Mich., Bloomfield Hills—Laymen's Retreat League, University of Detroit, East Jefferson Ave., Detroit, plans brick, steel, stone, concrete retreat building. $105,000 funds being raised. Architect not appointed.

N. Y., Armonk—S. S. Cohen, Maple Ave., Whipporwill, White Plains and Mount Kisco Rds., developing 52 acre tract and constructing dwellings at Maple Ave., Whipporwill, White Plains and Mount Kisco Rds. To exceed $100,000. Architect not appointed.

N. Y., Jamaica—Jamaica Fulton Operating Co., 6th Ave. and 50th St., New York, or c/o T. W. Lamb, 701 7th Ave., New York, plans 2 story, 100x229 ft. theater. $250,000.

N. Y., New York — Y.M.C.A. Retirement Fund, 347 Madison Ave., plans by Sampson & Levy, 341 East 149th St., heating and plumbing modernization in 5 story, 40x88 ft. club, Beck St. and Intervale Ave. $28,000.

N. Y., Richmond Hill—M. H. Koumrian, 85-45 118th St., will not build 3 story medical clinic building, 118th St. and 85th Ave. To exceed $105,000. Project abandoned. Noted May 24.

Wis., LaCrosse—Owner, c/o G. Zoegel & Bro., archts., 424 East Wells St., Milwaukee, plans 1 story, basement 34x174 ft. recreation bath house; 140x200 ft. swimming pool; and filtration tanks, etc.

Que., Montreal—Rakotile Mfg. Co. of Canada, A. W. Waldonkyle, pres., plans floor and wall tiles and byproducts manufacturing plant. $150,000.

BIDS ASKED

N. Y., New York—W. F. Weichbrodt, 34 Beekman Pl., bids about Aug. 1, general contract altering apartments, incl. elevators, dumbwaiters, boiler room, 32 Beekman Pl. $28,000. O. A. Staudt, 45 West 52nd St., archt. Noted June 28.

Wis., Appleton—July 16, by R. N. LeVee, archt., 117 East College Ave., 2 story, basement, 83x129 ft., brick, retreat house and chapel building, plans found., for Capuchin Franciscan Province of Wisconsin. $120,000. Noted Mar. 29.

CONTRACTS AWARDED

Calif., Los Angeles—Bullock's Department Store, Bway. and Hill Sts., altering framing on 1st to 6th floors (inclusive) to provide for installation of escalator, 657 South Bway., to P. J. Walker Co., 3900 Whiteside Ave. Total est. $200,000. Noted June 7, under "Contracts Awarded."

Calif., Redding—T. and D. Enterprises, 25 Taylor St., San Francisco, rein.-con., steel theatre and store, to Salih Bros., 25 Taylor St., San Francisco, $120,000. Awarded June 6. Noted Oct. 19.

Conn., Middletown—Wesleyan University, A. W. Johnson, supt. buildings, plumbing and heating for alterations, additions, improvements to Fayerweather Gymnasium, 1 story, 40x105 ft. brick, steel, concrete, to M. J. Daley & Sons, Inc., 543-555 Bank St., Waterbury***structural steel, to Berlin Constr. Co., Depot Rd., Berlin***electrical work, to J. W. Newton, 55 Wilcox Ave., Meriden. Total est. $105,000. Noted June 7, under "Contracts Awarded."

Ind., Anderson—Citizen's Bank, steel fir rebuilding bank building, to Pan American Bridge Co., Newcastle. E. R. Watkins, archt., Anderson, in charge of work. Noted June 28, under "Contracts Awarded."

Ind., Indianapolis — Owner, c/o H. Foltz, archt., 1135 Plythian Bldg., stucco brick suburban residence, to J. A. Young, 943 East 57th St. Est. $100,000. Noted June 21.

Mass., Wellesley—Wellesley College at office of Business Manager, heating for 3 story, basement, 54x189 ft. physics-chemistry building, to McMurrer Co., 303 Congress St., Boston; plumbing, to Wm. H. Mitchell & Son, Inc., 90 Arch St., Boston. Bids May 15, awarded June 28. Noted June 28, under "Contracts Awarded."

N. Y., Brooklyn—Corporation, c/o J. Poret, 510 Ditmars Ave., 6 story apartments, East 19th St. and Dorchester Rd., to Kingsport Building Corp., 510 Ditmars Ave. Est. $100,000 or more. Noted June 25.

N. Y., New York—Estate of Goelet, 606 5th Ave., altering, plumbing, refrigeration and air conditioning store and bank building, 606 5th Ave., to W. Crawford, 7 East 4th St. Est. $75,000. Noted June 28.

N. Y., New York—Leopold Buchsbaum, 215 West 98th St., plumbing, heating, boiler room for apartments, 153 North 84th St., to Gotham Constr. Co., 103 Park Ave. Est. $30,000. Noted June 28.

N. Y., New York—Maryland Realty Co., W. Labrot, pres., 17 Battery Pl., new heating system for apartments, 349 East 58th St., to B. Knopt, 439 East 58th St. Est. $28,000. Noted June 28.

Pa., Phila.—Lewis Baker Estate, c/o Lionel Friedman, Inc., 15th and Locust Sts., new store building, to S. H. Levin, 1619 Sansome St. Est. $100,000. S. S. Kresge Co., 114 5th Ave., New York, lessee. Bids June 26. Noted June 28.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Long Beach — PLANT — Santa Cruz Portland Cement Co., Crocker Bldg., San Francisco, making plans for cement treatment plant, incl. treatment mill, steel silos and sacking bins, West 7th St. $250,000. Test piles have all been driven on site. R. A. Kinzie, ch. engr. for firm will have charge of work and will probably take bids for construction of same when plans are completed.

Calif., Terrance — CHEMICAL PLANT — Hughes-Mitchell Processes, Inc., Denver, Colo., L. M. Hughes, chn. Bd. Directors, Majestic Bldg., Denver, Colo., W. H. Rose, pres., Chicago, Ill., T. A. Mitchell, vice-pres., Denver, Colo., B. Hughes, secy., Chicago, Ill., R. E. Cushman, treas., Chicago, Ill., plans construction of chemical plant for treatment of lead-zinc products therefrom, will handle 30,000 tons of ore at start of processing ore to be obtained from California, Nevada, Idaho, Colorado, New Mex-

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†*Federal Government.*

Industrial Buildings (Continued)

ico and Arizona, will use about 20,000 tons annually. Salts produced at Trana, Calif., from deposits in Searles Lake. An acre site for plant has been purchased on Normandie Ave., 190th St., near here. $1,000,000.

Ind., Evansville—PACKING PLANT—Weil Packing Co. soon takes bids general and separate contracts 2 story packing plant. To exceed $28,500. H. P. Henschien, 59 East Van Buren St., Chicago, Ill., archt. Noted May 4, 1933.

Ind., Indianapolis—PLANT—F-K Auto Trunk Corp., 2122 Northwestern Ave., plans plant. $28,000 or more with equipment. Architect not appointed.

Ia., Des Moines—PLANT—A. A. Schneiderhahn Co., 214 3rd St., plans altering and repairing manufacturing plant, Walnut St. To exceed $30,000. Architect not appointed.

Md., Baltimore — MANUFACTURING — Lockwood, Green & Co., archts. and engrs., 30 Rockefeller Plaza, received bids for manufacturing building, and indefinitely postponed project, for Gold Dust Corp., 53000 Holabird Ave. Est. $75,000. Noted June 14.

Mass., Dorchester — TANNERY — Neponset Tanning Co. plans completed by T. E. Hamilton, archt. and engr., 421 Marlboro St., Boston, 2 story, 70x160 ft., brick tannery, Tinnean St. Owner will award contract without competition. $40,000 or more. Noted July 5.

Mass., Revere—BULK STATION—Tidewater Oil Co., Bayonne, N. J., soon takes new bids 1 story, 16x73 ft. gasoline pump house, 3 story, 34x91 ft. office building, 2 story, 49x119 ft. warehouse, 1 story, 65x184 ft. garage, 1 story, 35x63 ft. boiler room for bulk station, concrete brick and timber construction, Chelsea Creek. Former bids rejected. Private plans. Noted June 21.

Mass., Worcester — BULK STATION — L. Goldberg, c/o Harry L. Meacham Associates, archts., 120 Front St., making plans 1 story, basement, 22x24 ft. service building, 2 greasing pits, 6 pumps, three 10,000 gal. and two 15,000 gal. steel tanks for gasoline storage, two 15,000 gal. steel tanks for fuel oil storage, roadways, etc., Southbridge St. $40,000.

Mich., Bay City — DISTRIBUTION TERMINAL—Gulf Refining Co., C. D. Wood, Bay City, completing plans gasoline distribution terminal on Saginaw River near Belinda St. bridge, incl. rein.-con. warehouse and office quarters, two 55,000 gal. and four 40,000 gal. steel storage tanks and appurtenances. $250,000. Priavte plans, J. H. Hamilton, Pittsburgh, Pa., constr. engr.

Mich., Detroit—BREWERY CELLAR, etc.—Regal Brewing Co., c/o Harley & Ellington, archts. and engrs., 1507 Stroh Bldg., plans 2 story, basement, brick, steel, rein.-con. brewery cellar and stockhouse, plain found. To exceed $28,500.

Mich., Detroit — FACTORY — Midland Steel Products Co., E. J. Kulas, pres., West 106th St. and Madison Ave., Cleveland, O., plans by G. Stoner, archt. and engr., c/o owner, 3 story, basement, brick, steel, rein.-con. factory, Mt. Elliott Ave. $300,000. Site purchased.

Mich., Holland — PLANT — Gillboat Corp. plans plant. $40,000 incl. equipment.

Miss., Greenville—WAREHOUSE—U. S. Gypsum Co., 300 West Adams St., soon lets contract 1 story, 146x234 ft., corrugated iron, rein.-con., steel warehouse addition, plain found. Private plans.

Neb., York—YARDS and STORAGE—Corn Belt Lumber Co., plans yards and storage, $28,000 or more. Architect not appointed.

N. H., Portsmouth — BREWERY — Frank Jones Brewing Co. plans rebuilding brewery, $80,000 incl. equipment.

N. J., Linden—DISTILLERY—Distillers Co. Ltd., Glasgow, Scotland, plans by H. Chapman, 420 Lexington Ave., New York, distillery, West Edgar Rd. $400,000.

N. J., Newark—PLANT—Bendix Corp., General Motors Bldg., Detroit, plans leasing 30-60 acre site, Port Newark, from city and plans auto parts manufacturing plant. $700,000. Architect not appointed.

N. J., Verona—LAUNDRY—Verona Washing Co., Linden Ave., plans laundry, $28,000 or more. Architect not appointed.

N. Y., North Tonawanda—PLANT—Becker, Moore & Co., Inc., plans rebuilding Plant 2, recently destroyed by fire. $50,000. Architect not appointed.

O., Akron—GARAGE—Owner, c/o H. M. Morse & Co., archts. and engrs., 823 Prospect Ave., Cleveland, making plans 1 story, 30x200 ft., brick, steel garage. $40,000.

O., Findlay—PLANT—Fassett Lumber Co. plans plant. $30,000 or more. Architect not appointed.

Pa., York—PLANT—C. W. Dietz Co. plans milk distribution plant. To exceed $100,000.

S. C., Florence—FREIGHT PLATFORMS, etc.—Seaboard Air Line, Norfolk, Va., plans freight platforms and storage. $30,000 or more. Architect not appointed.

Wash., South Prairie—LUMBER MILL—Marstatd Lumber Co. plans lumber mill here or at other location. $28,000 or more with equipment. **Maturity indefinite.** Architect not appointed.

Wis., Madison—Blessed Sacrament Parish, c/o R. Barthalemy, 2116 Hollister Ave., plans 1 story, basement, 60x100 ft. church, Allen St. $125,000. Architect not appointed.

Alta., Banff—BULK PLANT—C. D. Metaberger, Texas Co. of Canada Ltd., Regina, Sask., making plans bulk plant. $50,000.

Alta., Calgary—REFINERY—Trinity Petroleum Co. making plans refinery.

Alta., Vermilion—PLANT—C. D. Metaberge of Texas Co. of Canada, Regina, Sask., plans plant. $50,000.

B. C., Dollarton—POWER HOUSE, etc.—Canadian Robert Doller Ltd. soon takes bids power house, boiler house and other structures.

B. C., Vancouver—SAW MILL, etc.—Inlet Timber Co. Ltd. making plans saw mill, wharf and slip at New Westminster. $100,000.

Man., Winnipeg — TANNERY — Dominion Tanners Ltd., Parr St., preparing plans tannery. $40,000.

N. S., Halifax—PLANT—R. Douglas Graham announces early plans for spending $250,000 by Minerals Ltd., to develop properties in Guysboro County.

N. S., Halifax—COLD STORAGE PLANT—R. J. McSween, dir. Fisheries Bureau, Dpt. Agriculture, plans constructing cold storage plant at Glace Bay. $75,000.

Ont., Arnprior—SAW MILL and FACTORY—Canadian Pub. Broth Co. Ltd., Harvey St., plans constructing saw mill and addition to factory. $35,000.

Ont., Orillia—PLANT—Canadian Mechanical Rubber Corp. making plans. $50,000.

Ont., St. David—PLANT—Queenston Rock Wool Co. Ltd., C. M. Doolittle, making plans constructing plant. $50,000.

Que., Montreal—PLANT—Pepsi Colo Co. of Canada Ltd. plans constructing plant. $50,000.

Que., Pointe Aux Trembles—REFINERY—Champlain Oil Co. bids early in July, 2,500 bbl. daily capacity refinery, 23rd Ave., $350,000.

Sask., North Battleford — PLANT — C. D. Metaberger of Texas Co. of Canada, Ltd., Regina, Saska., plans constructing plant. $60,000.

Sask., Swift Current—PLANT—C. D. Metaberger of Texas Co. of Canada Ltd., Regina, making plans constructing plant. $40,000.

BIDS ASKED

Ga., Ringgold — FILLING STATION — July 16, by Mabry, archt., Rossville, installing 10 pump filling stations, erecting 50x90 ft. and 80x150 ft. shed buildings, 3 mi. north of here, for S. Hargis, Rossville. $30,000.

Mich., Ecorse — STEEL PLANT — Great Lakes Steel Corp., Ecorse, taking bids brick, steel, concrete buildings, concrete pile founds., for addition to steel plant to house hot and cold strip mill for manufacture of sheets up to 75 in. width, for automobile industry. $12,000,000. Private plans.

N. Y., Brooklyn—GARAGE and SERVICE STATION—See "Contracts Awarded."

N. Y., Richmond Hill—GARAGE—See "Contracts Awarded."

Pa., Phila.—WAREHOUSE—Swift & Co., 25 Faneuil Hall Sq., Boston, Mass., taking bids 1 story, basement, 50x100 ft. warehouse, 9th and Girard Sts., for Swift & Co., U. S. Yards, Packers and Stockyards, Chicago, Ill. $40,000. Private plans.

Tenn., Chattanooga—SERVICE STATION—J. Wilson, Feiger Bldg., taking bids 1 story service station, Lee Hy., about 12 mi. east of here. $35,000. Noted June 28.

Wis., Cedarburg — DAIRY PLANT and CREAMERY—Five Corners Creamery Co., and F. Schuman, archt., 67 Hanover St., taking bids 1 story, 60x90 ft., brick, tile dairy plant and equipment, incl. refrigeration machinery.

Wis., Mayville—SHOE FACTORY—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Fresno—WAREHOUSE, etc.—Firestone Tire & Rubber Co., 2525 Firestone Blvd., Los Angeles, represented by W. B. Mullins, California Hotel, 1 story, mezzanine, 125x150 ft., steel, brick warehouse and service station quarters, to Trewhitt-Shields Co., Fresno, approximately $50,000. Awarded June 22. Noted June 21.

Calif., Riverbank—WINERY—Riverbank Canning Corp., Riverbank, 1 story, brick, concrete winery, to J. A. Allen, 22 South Sutter St., Stockton, $65,000. Awarded July 2.

Conn., Meriden—FACTORY—International Silver Co., 48 State St., Meriden, structural steel for addition to Factory H, to Bethlehem Fabricators, 75 Federal St., Boston•••reinforcing steel, to Topper & Griggs, 200 North Main St., West Hartford•••plumbing, to C. N. Flagg & Co., Inc., 79 Griswold St. Noted June 7, under "Contracts Awarded."

Conn., Middletown—OIL TERMINAL—Sinclair Refining Co., 205 East 42nd St., New York, constructing bulk oil plant on Connecticut River, $50,000. Owner builds. Private plans.

Ill., Chicago—FREIGHT STATION—Wabash Ry. Co., E. L. Crogen, ch. engr., Ry. Exch. Bldg., St. Louis, Mo., altering freight station, installing rolling doors, 1214-1260 and 1300-1324 South Plymouth St., to H. A. Peters Co., 19 South LaSalle St.; structural steel to Sprague Iron Wks., 4410 Addison St. Est. $35,000.

Kan., Kansas City—HOG SLAUGHTERING HOUSE—Cudahy Packing Co., 221 North La Salle St., Chicago, Ill., and main office at 33rd and O Sts., Omaha, Neb., c/o T. J. Byrnes and A. W. Reef, purch. agts., Chicago, Ill.; rearrangement of interior and addition to present hog slaughtering house, etc., to Winn Constr. Co., Railway Exch. Bldg., Kansas City, Mo. Est. $50,000. Awarded June 22. Private plans by Owners Engineering Dpt., at Omaha, Neb.

La., Monroe—GAS COMPRESSOR PLANT—Southern Natural Gas Co., gas compressor plant, to Ford Bacon & Davis, 30 Bway., New York. To exceed $35,000.

Md., Baltimore—MEAT PACKING PLANT—W. F. Stone, Jr., archt., 2612 North Charles St., altering 40x48 ft. present building and constructing 3 and 4 story, 40x55 ft. and 15x60 ft. brick, rein.-con. addition, plans found., for Consolidated Beef & Provision Co., Lombard and Exeter Sts., to J. Henry Miller Inc., Eutaw and Franklin Sts., $80,000. Noted May 31.

Mass., Weymouth—WAREHOUSE, etc.—G. F. Cahill, 18 Tremont St., Boston, 1 story, basement, 30x80 ft. and 20x50 ft. brick warehouse and store, concrete found., Pleasant St. to Abel Estey, 53 State St., Boston. Est. about $28,500. First National Stores, Inc., 5 Middlesex Ave., Somerville, lessee.

Mass., Worcester — PLANT — Sherman Envelope Co., 60 Prescott St., 1 story, 165x200 ft., brick factory unit, to Thos. Mulcare, Inc., 66 Western Ave., Brighton. Est. exceeds $28,500. Private plans.

N. J., Edgewater — BULK OIL STORAGE TANKS—Valvoline Oil Co., 621 River Ave., bulk storage tanks, incl. 400 tons steel, to Chicago Bridge & Iron Wks., 30 Church St., New York, and Chicago, Ill. Est. $28,000 with equipment.

N. Y., Brooklyn—GARAGE and SERVICE—M. O. Parker, 1412 Mermaid Ave., garage and service building, Neptune and Cropsey Aves., separate contracts. Est. exceeds $28,000. H. J. Nurick, 4 Ocean Parkway, archt. Noted Feb. 22.

N. Y., Kinderhook—DISTILLERY—Hendrick Hudson Distillery Co., 22 East 40th St., New York, distillery, to A. E. Rossell, 22 East 40th St., New York. Est. $100,000. Noted Feb. 1.

N. Y., New York—GARAGE and SERVICE STATION—Hickey Bros., foot 6th St., Brooklyn, altering two 2 story, 100x100 ft. garage and service station, 680 12th Ave., separate contracts and day labor. Est. exceeds $28,500. Ross & McNeil, 274 Madison Ave., archts. Noted June 28.

N. Y., Richmond Hill—GARAGE—F. and D. Coffey, E. Ulshoefer and J. C. Cogan, 100-04 90th Ave., 1 story, 100x190 ft. garage, 90th Ave. and 102nd St., separate contracts. Est. $35,000. J. Berlinger, 227 East 45th St., New York, archt. Noted May 24.

O., Cleveland—SHOP—Rupp Forge & Shear Co., c/o A. Zverina, mgr., 1735 Winter Ave., concrete work for 1 story, 50x101 ft., brick, steel, concrete drop hammer and forge shop, to Paugh & Brown, 5706 Cedar Ave. Awarded June 29.

Oklahoma — STOCKYARDS — Tulsa Stockyards, Inc., E. J. Dick, company atty., constructing modern pens for stock, administration building, etc., on 20 acre site on Sand Springs Ry. line between West Tulsa and Sand Springs, to Ellis Constr. Co., Tulsa. $68,214.

Tex., Beeville—UTILITY PLANT—United Gas System, 2 story, basement, 116x410 ft., rein.-con. utility plant, plain found., to V. Falbo, Builders Exch., San Antonio. $40,000; air conditioning system, to Dixie Heating & Ventilating Co., Beeville and 109 Fannan St., Houston. Est. $60,000. Awarded June 24.

Wis., Lomira—REPAIR SHOP and GARAGE—Lawrence Ries, 1 story, basement, 40x40 ft., brick, steel repair shop and garage, to Rhode & Kapelle, Mayville. Awarded June 25. Owner in market repair machinery and equipment. A. Kuenzi, Watertown, archt.

Wis., Mayville—SHOE FACTORY—Mayville Impvt. Assn., 2 story, basement, 80x132 ft., brick, rein.-con., steel factory, day labor, $50,000. A. Kuenzi, Watertown, archt. B. & B. Shoe Co., 1508 Fond du Lac Ave., Milwaukee, lessee will buy all equipment for shoe making and electrical power equipment.

Ont., New Toronto—FACTORY—Anaconda American Brass Ltd., 8th St., general contract 1 story, brick, steel addition to brass factory, to Jos. Wilde & Co. Ltd., 10 Dublin St., Toronto, $75,000.

Ont., Toronto — FACTORY and WAREHOUSE—Canadian Westinghouse Co. Ltd., 286 Sanford St., general contract 3 story addition to factory, King and Peter Sts., to Redfern Constr. Co., Ltd., 36 Toronto St.•••plumbing and heating, to W. J. McGuire Ltd., 91 Jarvis St.•••laying pipe, to R. Fitzsimons Co. Ltd., 21 Rebecca St., Hamilton•••elevators, to Turnbull Elevator Co. Ltd., 126 John St. Est. $75,000. Noted June 21.

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